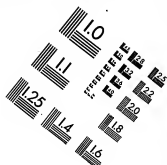
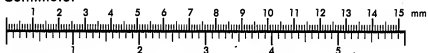


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Management

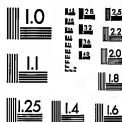
MS303-1980



Centimeter



Inches



Thomas A Edison Papers

A SELECTIVE MICROFILM EDITION

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(1850-1878)

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START

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1. The first of the three conditions is that the
applicant must be a citizen of the United States.
2. The second condition is that the applicant must
be at least 21 years of age at the time of
application.
3. The third condition is that the applicant must
be a resident of the United States for at least
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7. The seventh condition is that the applicant must
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five years before the date of application.
8. The eighth condition is that the applicant must
be a native-born citizen of the United States.
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10. The tenth condition is that the applicant must
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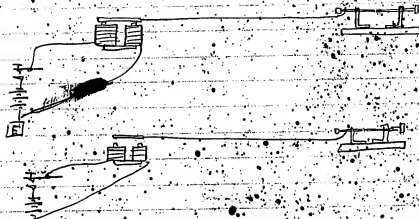
Electric force

The object of this invention is to transmit intelligence
or through ~~over metallic wires~~ of indefinite lengths.

The invention consists first in the discovery of a ^{in physics} new force, power or mode of motion capable of performing work ^{which force is} ~~which is neither heat~~ ^{which is neither heat} ~~light electricity~~ or magnetism, and the application of such discovered force to an instrument capable of indicating ^{the presence} to the senses,

the force generated from Electricity or magnetism ~~from~~ by aid of almost all final apparatus which is capable of generating ^{or indicating either} the same.

I shall describe several methods by which this ^{new} force or mode of motion may be generated.



2

Fig. 1

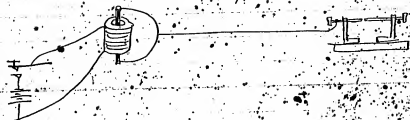


Fig. 2



Fig. 3

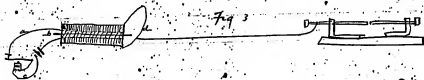


Fig. 4

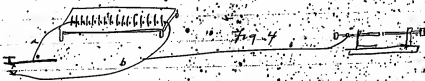


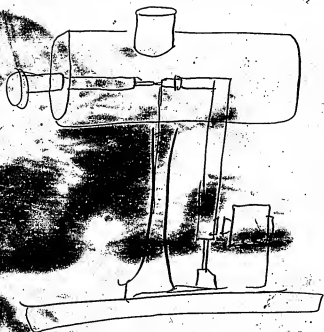
Fig. 5

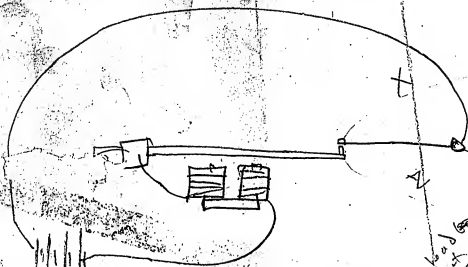


Etherio

Ta Edison

Chas Batchelor





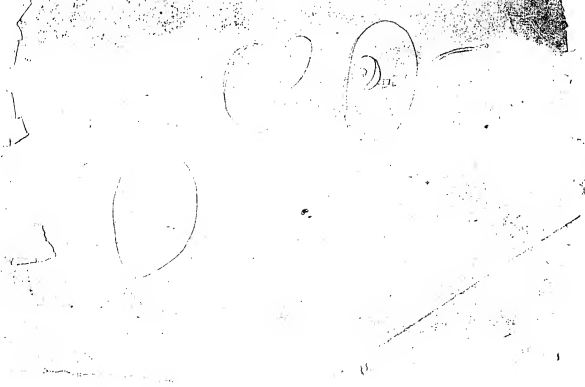
Get it only
on

3. size pin has
slight very blunt

~~3. size~~
one

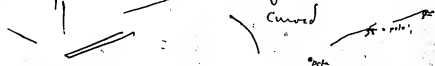
~~3. size~~
bulky

with po



Lead & Wale 599 -

Seems to be more scents than on iron, the prongs are all shot & do not spread out like on iron, the prongs seem spread most on Copper Charcoal ~~then~~, nothing, rather the opposite of a scent,



Copper on iron, no forked scents yet if I lay a watch spring on iron & touch Copper to it I get the forked scent. = peculiarly scents of Cu on plate iron shoot out $\frac{9}{10}$ of them below angle 5 deg



Copper & Aluminum

aluminum scent & X dull -

Cop & Nickel - Very dull scents but few



some of them at $\frac{1}{2}$ near pole very dull last half brighter
there is other peculiarities about these scents, haven't time to investigate

Waltch spg in Zinc

I don't see any Zinc scent I notice that the forks are smaller although they shoot out, apparently as far as may scent as or less =

Characteristic iron scent are mostly below 45-
where Zinc Scent are mostly above 45-

Waltch spg + Tin -

iron scent the 8 + 11 also notice ~~the~~ individual fine long
nickel scent but not so strong as nickel
only get little tin on hand SMC have to try the experiment
again

~~Waltch spg + Platinum~~

Charlton

get (dotted) line dull
red x point color + bright

iron scent there

Charlton

can feel soft
have dull red point of 3
eyes about 100 (10) of 3
faintly pinkish
dull red and a break
short line

See this in iron
guess didn't notice box

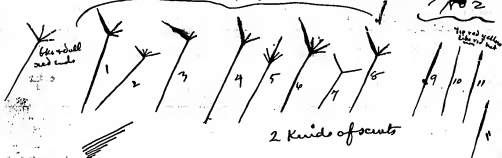
do on Silver

notice that scent shoots out + has no stalk you may see
the prong, often are such as so far the critical, when
those that widely often apparently have a big prong,
also divided

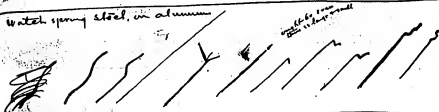
do Copper Scent notice anything peculiar

there some explosion or appearance as in Argent
above

water spring on common ^{seed} rivets in
No. 1.



water spring steel, in aluminum



water spring rivet



These four lines about
out about 1000 ft. out
see my above note of 15.
X line very nearly
about 15 ft. out
about 5 ft. out
or more as it may be
70 & 100 ft. out
also 11 but they are very weak

(7)

Edwards to have several
tuning forks and
surround them with
helium connected to the
line or use piano wire
strings and surround
them,

Or surround the ends
with the helium ~~and~~
vibrate them constantly
by closing the circuit of
acertain strength the
tone will be attained
& you read by chat,

Use sulphate of
Lead & H₂O

45

Permangan. K. an organic
sub & chl. K. The
alkali K set free
allows organic matter
reduce Perm. K. into
green mark, use sugar

Reproduction Autograph
acetate or Soluble salt

Hg - wet paper: ~~Common~~
lay on tin foil. the
metallic Hg reduced
amalgamates with foil
& when rubbed takes
foil with it. leaves indelible
also useful engraving process.

an alkaline Nitrite

Ferro. K. acetate - boil
add =

Ammonium Sulphide

Wet paper blue mark

Very sensitive,

to the Nitrous A of the
Nitrite that does it

Watts Sup 2nd. p 854

Diamidobenzic Sulphate

& a Nitrite. Felgh Sol

dissolve 1 pt. of Nitrous A

in 5 million - Watts

2nd Sup p 854

[3]

Make a bath of molten
lead. immerse two
Carbon or platinum Electrodes

Connect on a powerful
+ quantity battery

(10) 40 cells $1\frac{1}{2}$ Galtry

all Connected as 1

Cell - See if cant
decomp it. also try

Zinc antimony =

also try molten Ar

See if it dont take it
out of pb -

[4]

No 59-284 - B. Snow 579

Lewis Buffing - Dental Plugger
Instrument - The plugging tool presses
against the filling with both pieces in the case
makes the tool stock recede imparting its motion
to the lifting bar and hammer until the
bar passes the incline of the wedge releases
the tool on the catch and releases the hammer
which descends under the influence of the
spring - the force is regulated by

device operated by an exterior band.

Operation - First - causing the tool holder
to recede from the hammer and distance
after a blow is given, in order to obtain
distance between the hammer & the end of
the tool holder for a new blow substantially
as described. - Second - placing a spiral
spring G in the top of the case to act upon the
hammer in combination with either
the adjusting stopper I or screw J for
the purpose of causing the hammer
to give heavier or lighter blows as required.

Third - The combination of the spring R and
stop screw S and collar is for the purpose
and substantially as set forth.

Fourth - Constructing the lifting bar D
with a dent for combination with a
receiving hole in the upper end of the tool
holder bar E and with

Newark, N. J. *March 11* 1876.

Mrs. L. L. Leland & Co.



BOUGHT OF **CONDIE, HANSON & Co.,**

IMPORTERS AND MANUFACTURERS OF, AND DEALERS IN

Acids, Alkalies, Dye Stuffs, Shellac, Alcohol, &c.,

C. HANSON CONDIE,
JEROME HANSON,
ABRAHAM VAN WINKLE.

236 MARKET ST., COR. MULBERRY.

18' Oil Valve

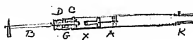
a notch or shoulder at its upper end as shown at d 3 to
allow it to engage with the stops L L' on the hammer for the
purpose of forming a direct connection between the tool holder and
hammer substantially as set forth.

5

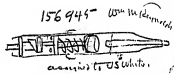
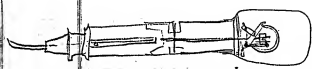
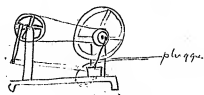
90

List of patents issued in the United States for
Dental pluggers or mallets.

Year	Number	
1865	30,428	
1866	38,237	
1866	39,284	
1867	39,784	
1868	61,460	
1867	79,270	
1869	67,114	mechanical
1869	90,879	
1869	91,849	
1872	125,482	
1872	130,954	
1872	131,123	
1873	145,057	
1874	156,945	
1873	146,380	
1874-5-6	158,888	
	158,863	
	170,045	Electric - Bonwill
	170,129	
	169,028	Electric - Green
	166,843	Electric - Bishop
	161,393	
	166,782	
	163,412	
	163,306	
	164,244	
	165,701	
	166,709	mechanical
	166,700	
	167,197	
	166,139	
	171,170	
	171,119	Electric
	171,121	Electric
	171,123	Electric
	173,619	Electric
	173,864	Electric - Petz



91849 =



59173

90579.



67114



125452



146580



130954



158888



131123



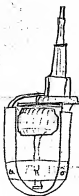
158863



145051

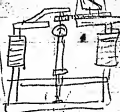
167203.
same rest

(1887?) Note
Patents
Machine parts
9/28/88



159 028

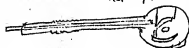
Drill
Assigned White, by
Green



166
843

Bishop, to White

161393



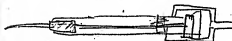
166752
to same as above



1-63412



163306

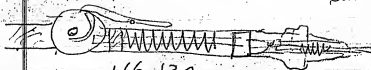


164244



165701

166709 + 166700
mechanical plug
same rest

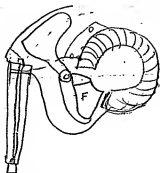


166139

167197
same rest

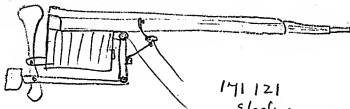
171 170

Same as 171



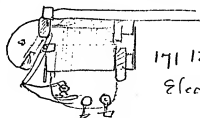
171 119.

Electric



171 121

Electric



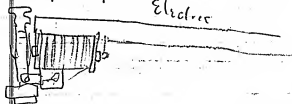
171 123,

Electric

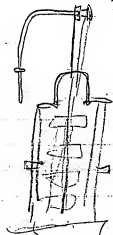
Patent
173 864

173 619.

Electric

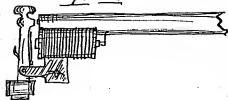


173 893
Same as 171



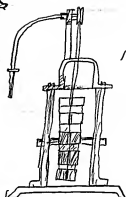
See the sketch for

173. 619

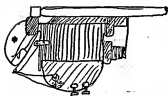


173. 864.

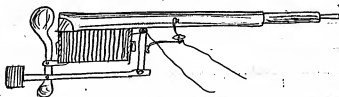
Sketch - Alca



171. 123.



171. 121.



33.485

33.398

33.566

~~37.315~~

1861

Reducing Copies of Engravings

1869

90.388

91.849

97.868

93.563

93.625

94.014

87.835

93.689

97.241

97.571

92.066

96.332

88.061

96.395

85.580

90.879

92.028

92.657

Drill for polygonal holes

Electric force

Inst for describing spiral lines

} Transmitting Rotary motion
Paper Ruling

} Stencil apparatus

1857

Engraving Copying Engraving by Electricity (Bain)

17.146

17.290

Mach for Eng. designs 2 W a Tol case

" " " on cylinders

10/21

3 Copy Machine

1865. VIIT

unwound de not be good. recording glass?

Multiply \rightarrow Cap ACFN Re st Dicta 73574. 1865

74629 — 1868 —

79.270

81.452

79.819

79.901

78.619

78.629

80.463

83.708

81.986

79.286

75.544

77.231

74.376

76.432

74.337

82.674

79.424

79.927

84.390

73.669

82.834

75.544

77.370

76.161

76.965

Flexible abrader

Electric fuse

Spiral gearing

paper miling machines

miling machine, "

Spiral gearing

66.330

63.709

62.504

61.460

71.595

71.361

60.466

62.352

63.380

69.820

70.553

72.553

70.281

60.663

61.382

68.571

70.715

70.925

63.262

71.950

41.927

45.224

42.533

Aug 1/854

5596

16175

14682

14598

1867
Cable for rail road & under DrillingDrainage Inset
for the hole

Explosive

Eng. Mach

forming deep in way, etc

Drilling Machine

Paper ruling by magnetism

Paper ruling machines

1867
Drill

Tooth plugger

Electric Machine

Eng. copper

Relief plates

1854
Electric Engine

Elec engine 1854

Elliptograph

20c ~~10c~~

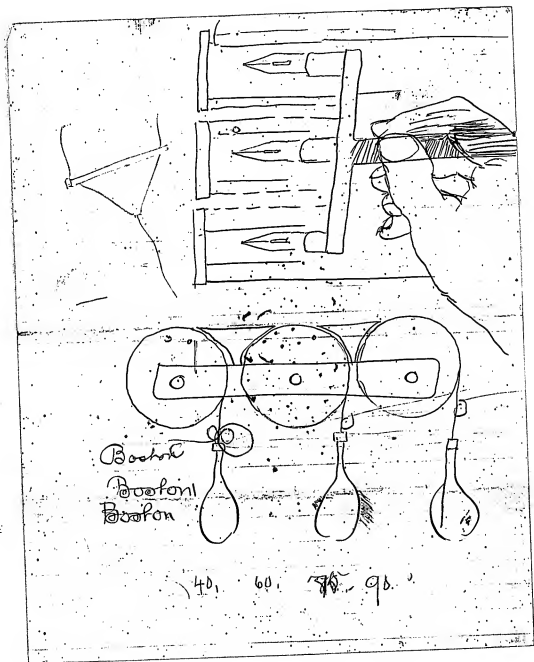
" " 10c

over

1870 (automatic)

29,300

99414



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

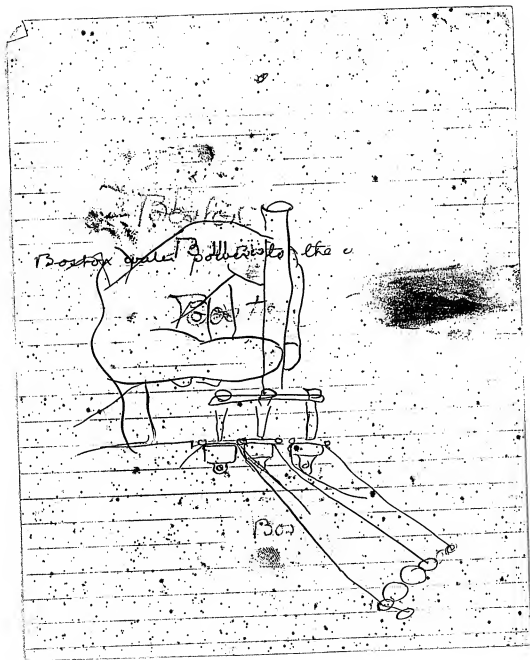
to act as
agent of the said company, in the settlement for, and
collection of said monies, and it is agreed that the
said company will honestly and truly pay or
cause to be paid to the said

one half the amount received by any
in account of such settlements and collections for
all monies now due to said company by parties
to be named by said

and to pay to
of all monies received in account of such settlements
which shall become due from and after this date for
three years from the date hereof

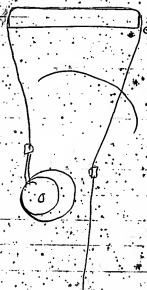
the said railroad company to commence a suit in
court to compel

to be not at all the expense of
same, except the ordinary routine business of the
said company which can be by that company in



Ass.

Boston



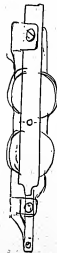
or Boston



feeling vibration
 of turning fish on
 palm hand

Phenomenon -

If you write on outside upper
 of ^{back} paper - above you can't see it
 through it. you can see it if
 look through a tube or magnifying
 glass close to paper. The tube
 prevents the reflection of light
 from the surface of the paper.



Reed pen
 Turning

T. A. Edison

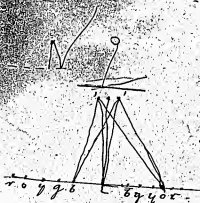
150
15
450
151

\$3 = 1500 lb coal per day

300
900
600

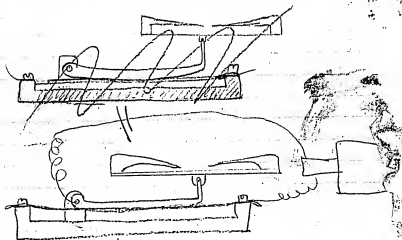
Charvatichia

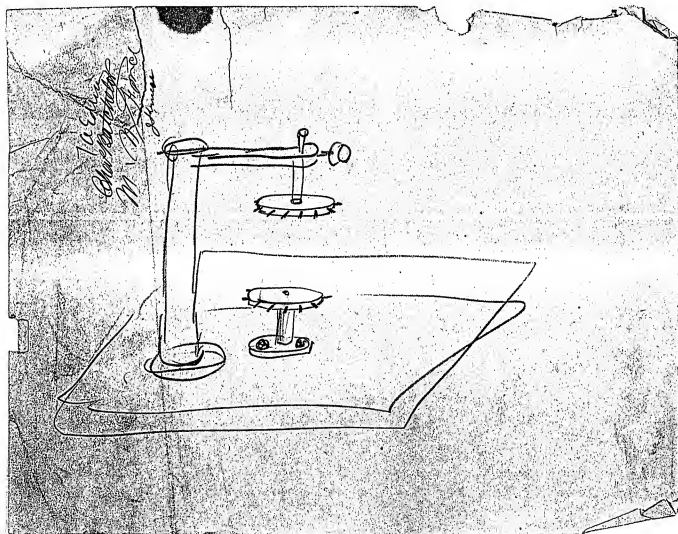
T. A. Edison



11111

7th Edition

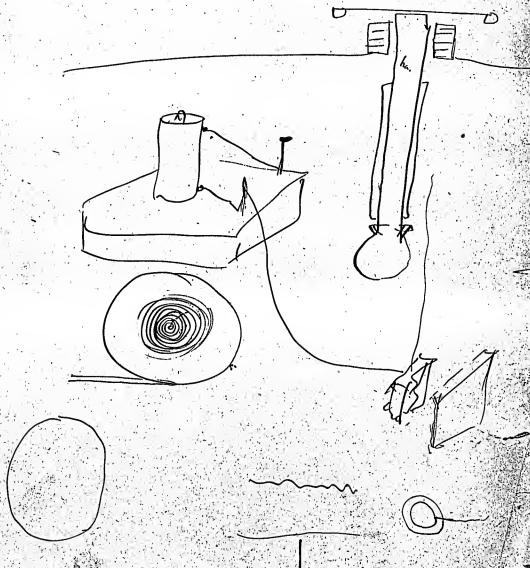


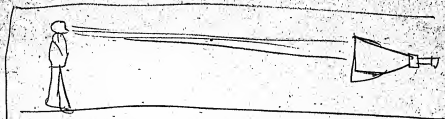


J. A. Edison



J. A. Edison
Charlestown





Ta Ehsa



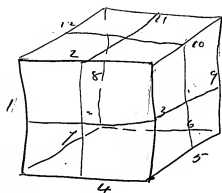
moving on these

$\frac{43}{36}$ $\frac{1}{16}$ $\frac{1}{16}$
 $\frac{18}{9}$ $\frac{2}{4}$ $\frac{1}{6}$
 $\frac{4}{2}$ $\frac{5}{6}$ $\frac{8}{8}$

add
add 2%

$8\frac{9}{16}$
 $8\frac{5}{8}$

The End



1-8

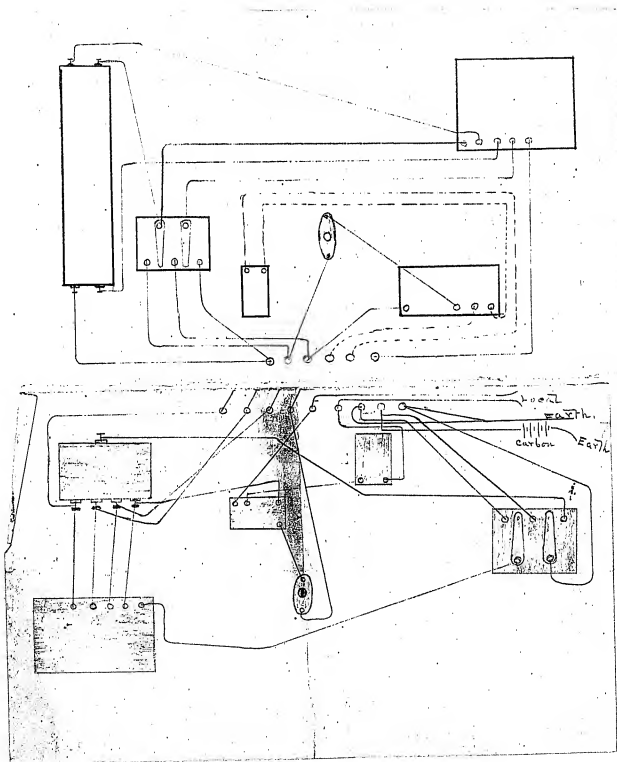


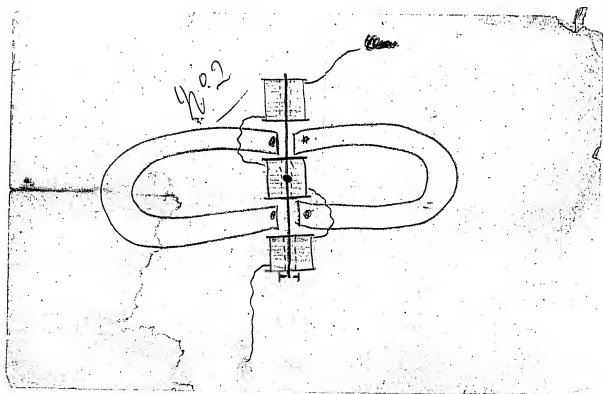
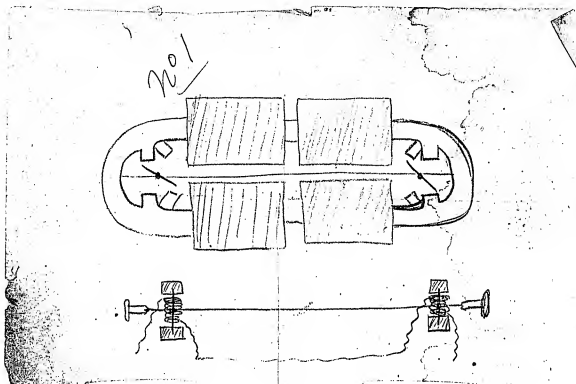
24
12

12

3

332





T. A. EDISON.

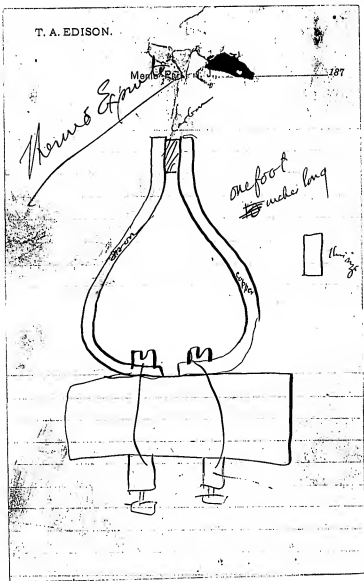
Memorandum

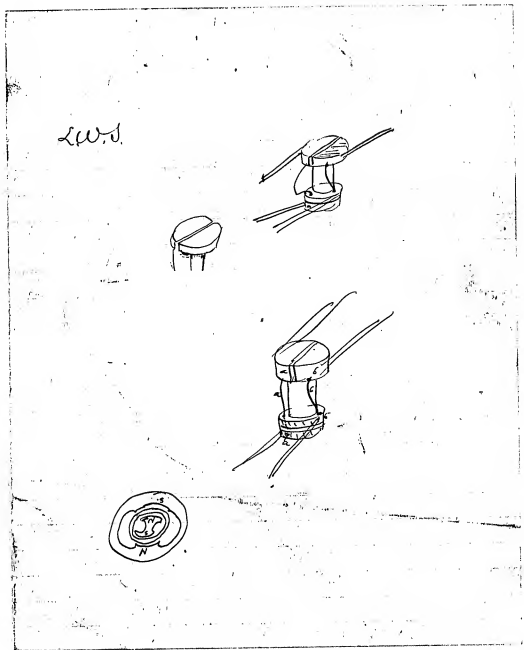
187

Mercury Spout

*one foot
to make long*

11 in





1 piece to turn up 16" in long
and 5" thick

12 inch circle $\frac{1}{2}$ thick
~~12 inch circle $\frac{1}{2}$ thick~~



Vis

Vis

88

88

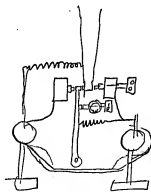
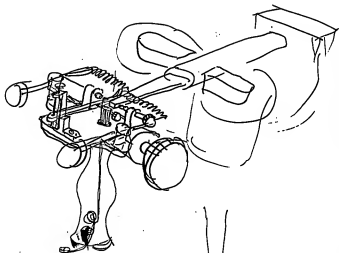
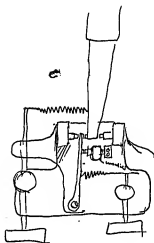
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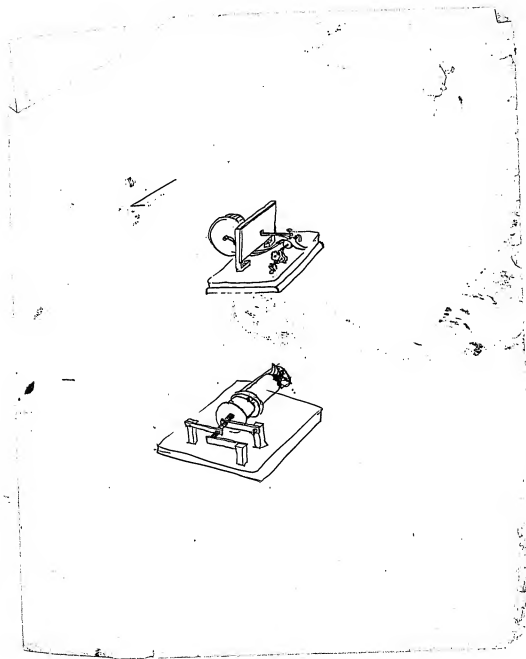
88

88



20





Worth to finish water.

Worth & Krugi to finish Gas Engine
for Engraving.

Krugi to finish turning forks, up =

To fix air pump,

to fix up mirror galvanometer.

13

26

28

Sketches, 1886.
T. A. EDISON.

Buesi

Dr

Menlo Park, N. J.

187

Things for Barker

- 1 Photograph
- 1 Table ^{This must be tested for receiver} ^{the only work receiver} with reels for receiver; with paper.
- 1 Photograph bell

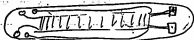
New diaphragm on voltmeter
same as old one and send
also.

Send some paper (femal) to
him also.

C. Batchelor

Muni

Will you bore this out
as large as you dare and
put it on this large base
so the two big wires to
top of these
large connections
you made -
and the secondary wire which
is double to form end part
on the other end as in sketch
I should have finished I suppose
but I got a light blow from
the latter and it has made
the bad.



T. A. EDISON.

Menlo Park, N. J., _____ 187

Wm. S.

Will you see that
Sherdore is kept busy at
setting the lampblack if
he dont do more of that
we must get some one else
in his place

Will you get the Johnson
transmitter or anything
there is towards one of
ours and see about fixing
one up for Barker

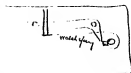
T. A. EDISON.

Menlo Park, N. J., _____ 187

Wm. S. fix up the H lever
box instrument on bracket
small piece wood to show it screwed
on wall for patent office
I put a



small coil
spring from
bottom of battery
to base as
Barker



O. L.

T. A. EDISON.

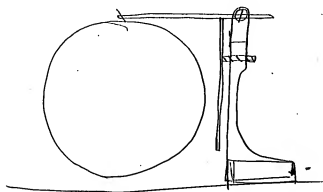
Menlo Park, N. J., 187

Then the lever of the machine
was so stiff we could not move
it. It bent on us.
Be sure that the centers
are always free.

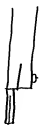
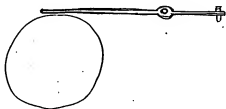
Jackson's spring instrument
wants ~~to~~ a center expansion
rod ~~two~~ sizes larger than the
one he had in.

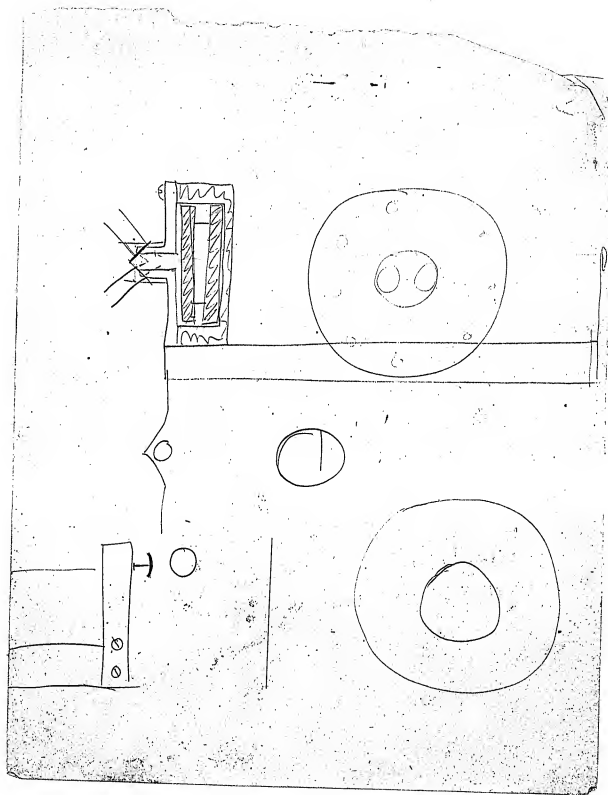
Also take of the small springs
on the levers the double points are
a failure

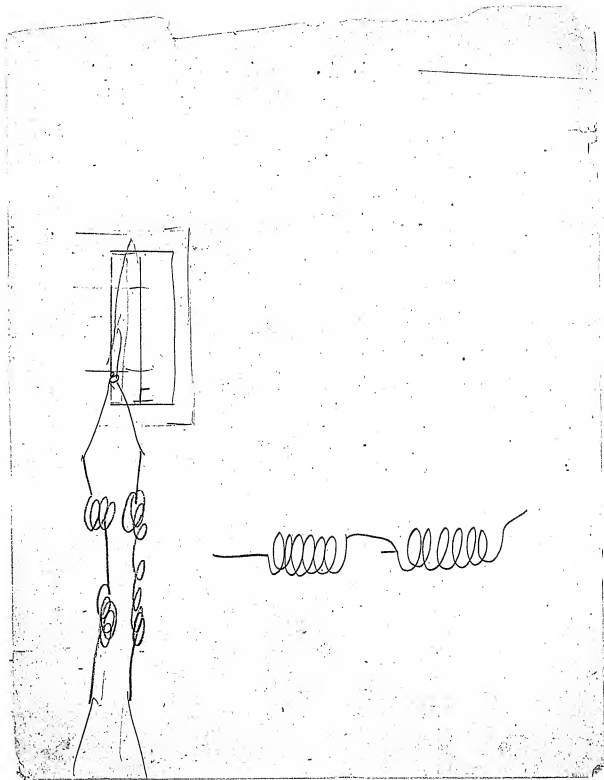
I put the drawing of the other
instrument here just as along
now I will be here early and explain.
P.



Make lever a quarter inch
longer on one side only &
small





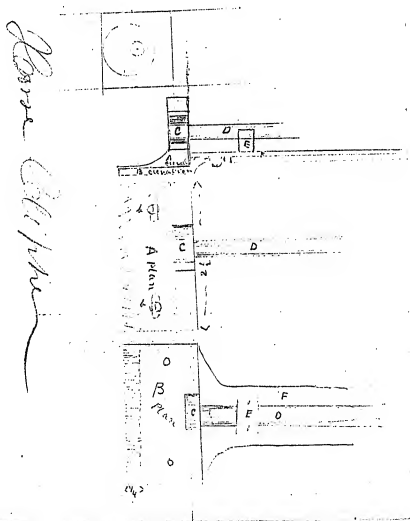


THE REDUCTION RATIO FOR THIS DOCUMENT IS 16:1

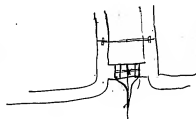
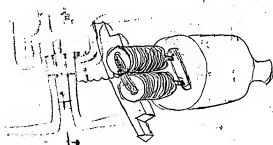
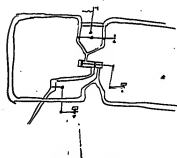
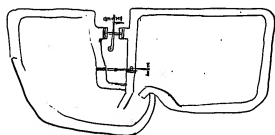
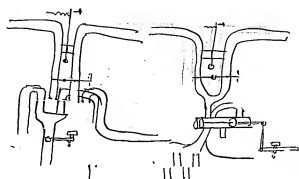
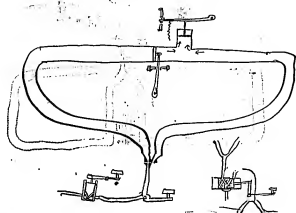
A is a movable part that slides across B motion
 obtained from the eccentric C on shaft D
 so D is connected to electric motor

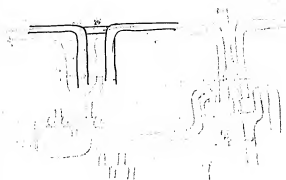
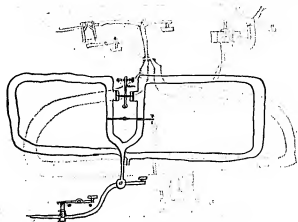
E is a bearing for the shaft D. F is the frame
 for holding the mechanism in the barrel and also
 for attaching the electric motor and also for
 securing to work through for spindles.

The plate B is cut like a saw tooth about $\frac{1}{8}$ inch. The
 sliding plate A has the teeth & shape similar to
 a moving machine knife. Length of both is
~~the~~ 2 $\frac{1}{2}$ inches



& passing ~~it~~ into a cleaner the wire and ^{then turning} it they only have to tie the cone & to fix by the small end of the cone the commencement of its machinery & to hold it lightly against the 1st wheel in such a manner ~~as to~~ that the projecting part into the hollow part and once arrived at the large end of the cone they fix it by means of a screw or a rivet to the other end of the back & it then only remains to heat the whole by placing some drops of tin in order that all the wheels may be & as the same time to the conical cylinder.





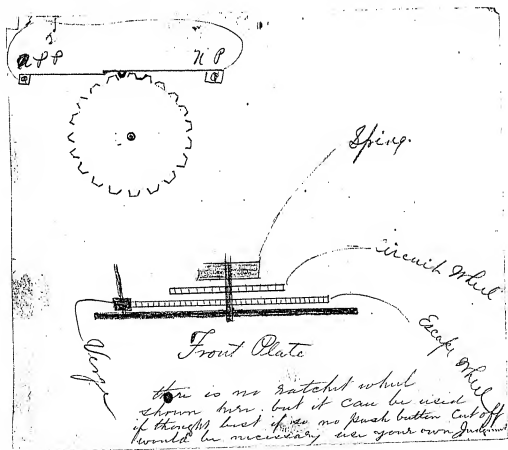
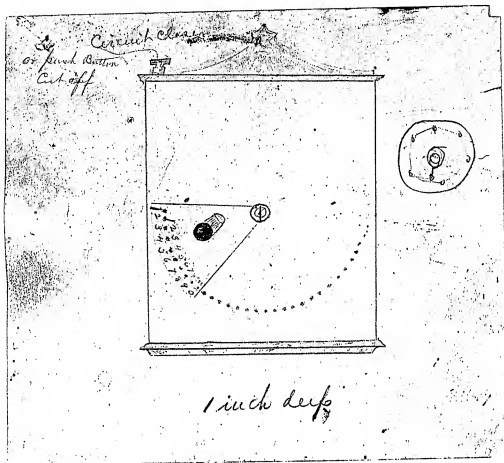
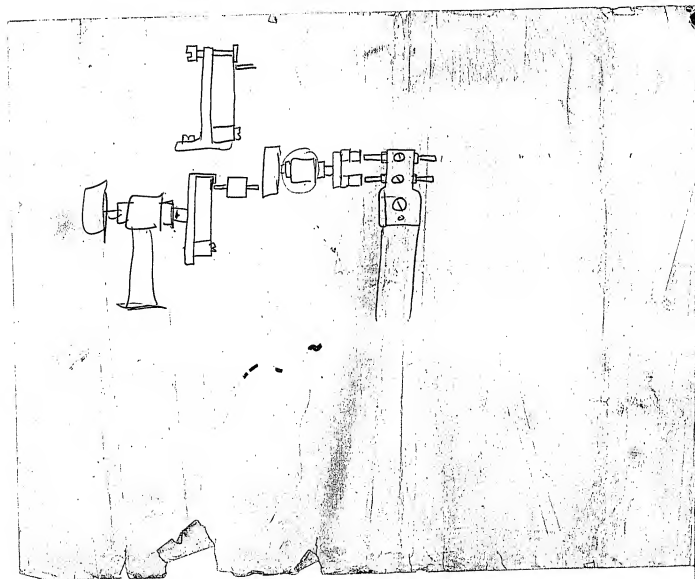
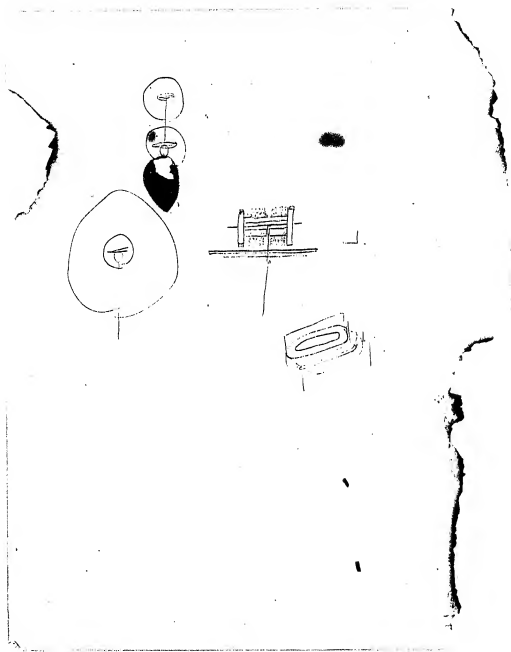
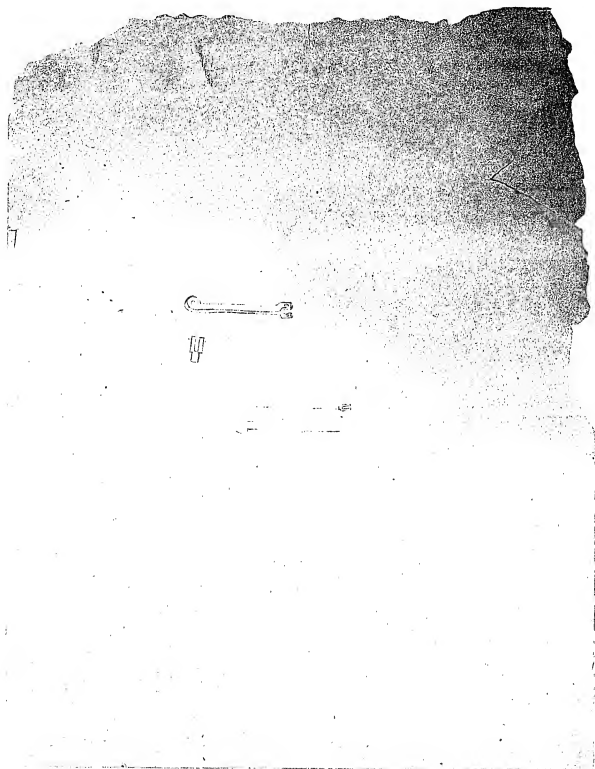


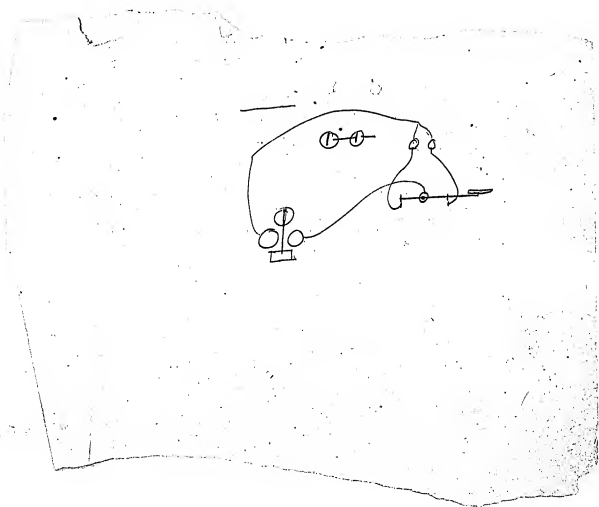
Fig 1 is the article complete, mainly
in a ~~cross~~ longitudinal section.
The parts used in its construction
are a tube like fig 2 and two
rubber bulbs like fig 3. The tube
A may be of tin or wood 10 to 12
inches long, with ^{several} perforations in the
space of two inches from each
end. If the tube is tin, an ordinary
brass a-a should be soldered at each
end to prevent its cutting the rubber.
The diameter of the tubes should be $\frac{7}{8}$
or $\frac{3}{4}$ inch. - The Bulbs B are rubber,
pear shaped, for ordinary size about
3 inches diameter and same length
on line x-x, a neck b, $\frac{1}{2}$ or $\frac{3}{4}$ in
long extending beyond b. of a diameter
to normally fit tight in tube A.
A ~~the~~ bulb is fastened to each
end of tube, being passed over
end & brought down so that the end

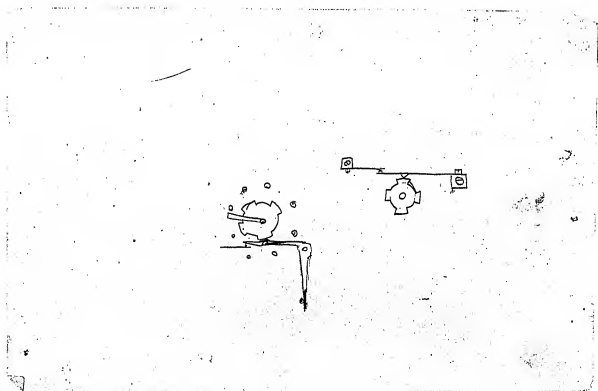
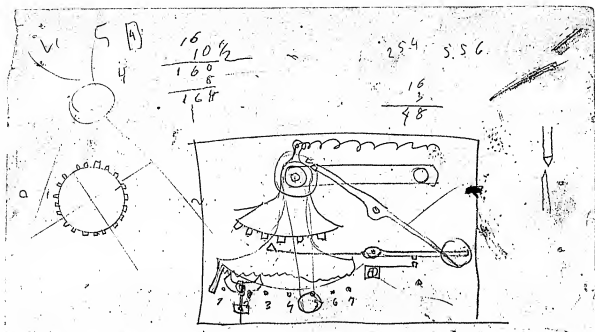
or rather a nests against top of
bulb, a little rubber cement is
put in neck & and it tightly map-
ped to it by a fine wire or string
making an air tight joint. Then
the bulbs are fastened on care is
taken that each is not more
than 1/3 full of air, which can
be done by slightly compressing
them as they are fastened on.
being constructed in this
fashion if a piece of cloth be loosely
thrown over one of the bulbs &
introduced into the chimney, the
operator grasping the other bulb to
manipulate the device, forces the
air from it thro' the tube to the other
bulb distending it and forcing the
loose cloth against the sides of
the chimney, so that by rotation &
compression it may be easily cleaned.
The ordinary cleaners are wooden
or wire frames, of various style &

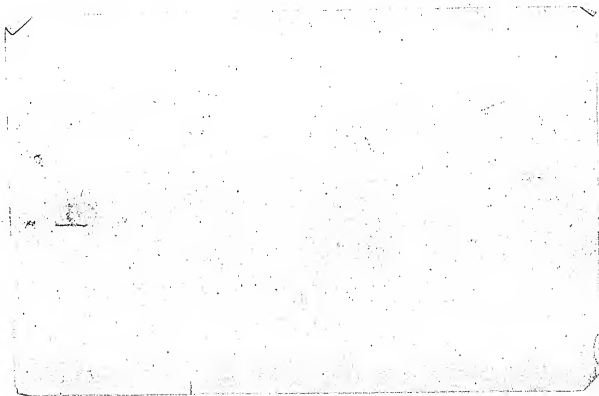
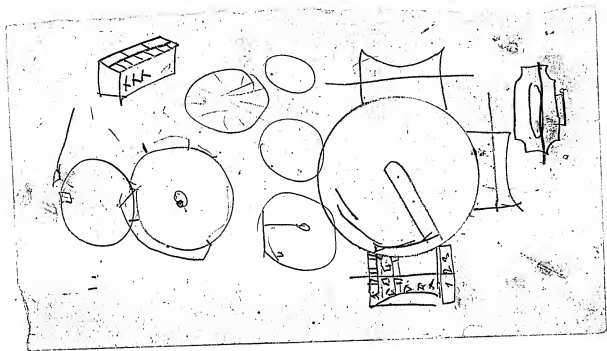


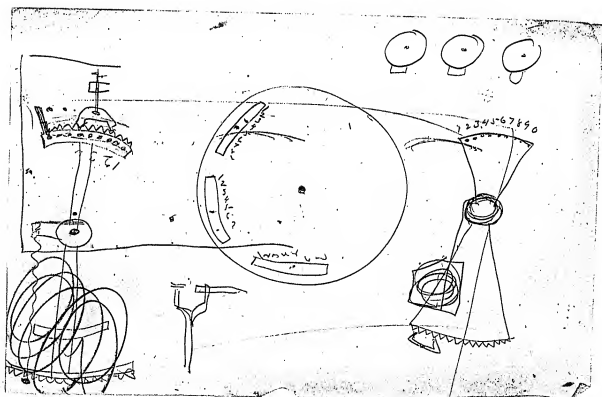
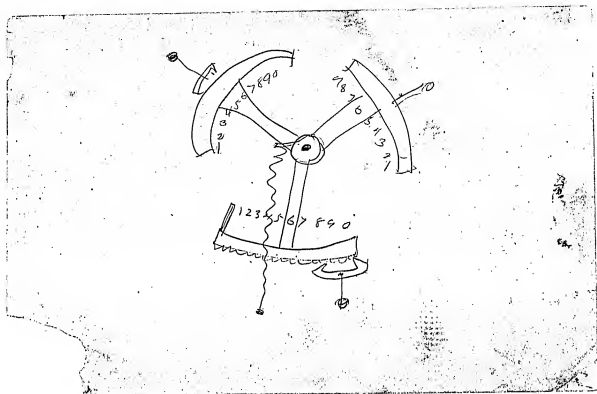


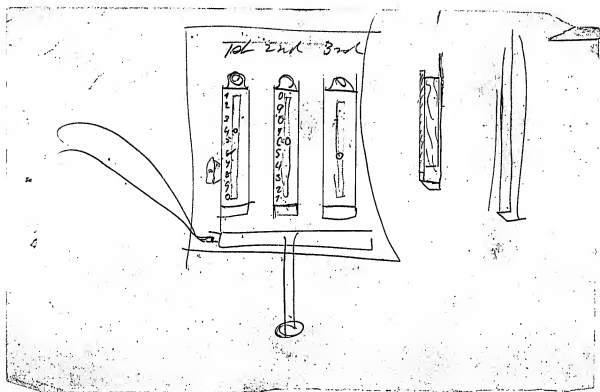




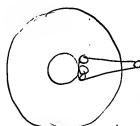
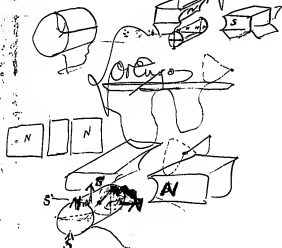








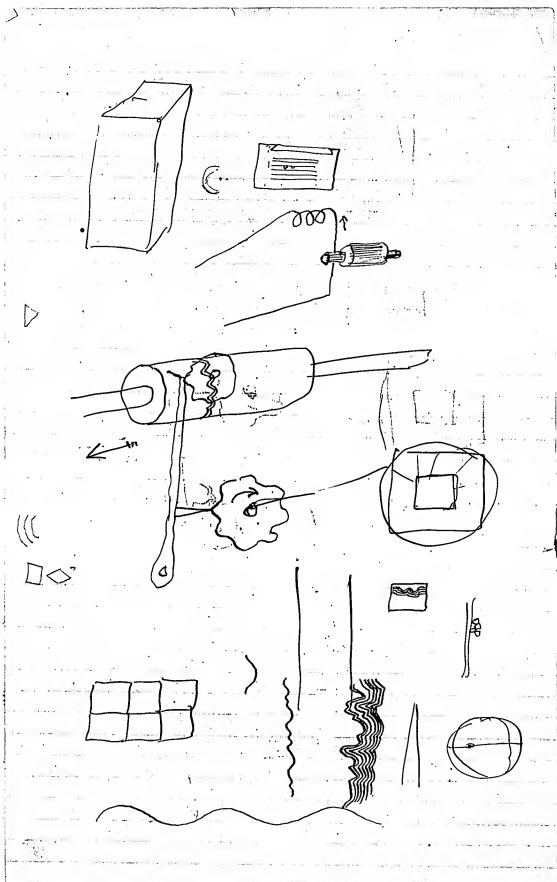
Lovelace 2000 mm
 Lovelace 1,200,000
 Lovelace 1,200,000
 Lovelace 5 million
 Lovelace 50, 6 days
 Lovelace 1 week
 Lovelace 100%

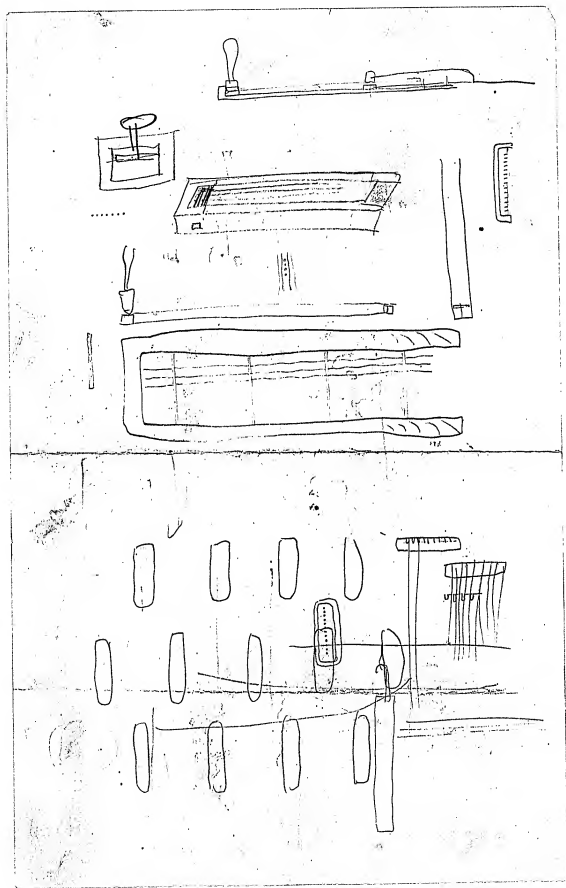


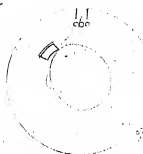
Thompson's
 12 2400.00
 6 9600.00
 14 3 9600.00
 28 1 1/2 9600.00
 56

8 ft 40 miles

12000-
 2400.00
 9600.00
 9600.00







$\frac{1}{2}$

104
104
104
104

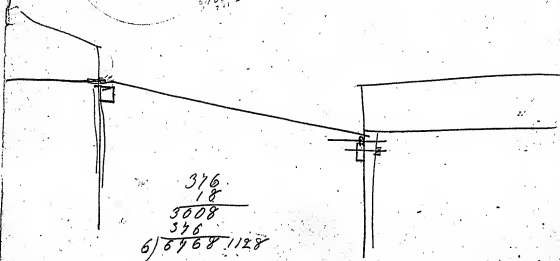
0 $\cdot 3 \times 1 = \cdot 3$ square mol

005

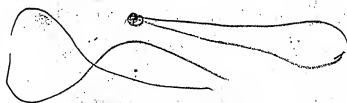
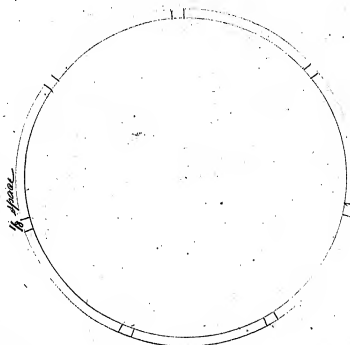
1.00

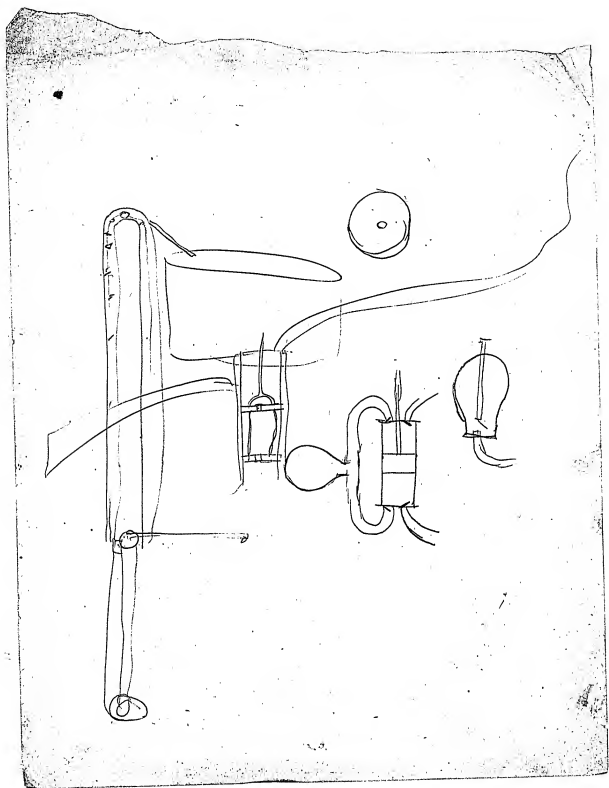
200 x 3 = 60
100 x 6 = 60

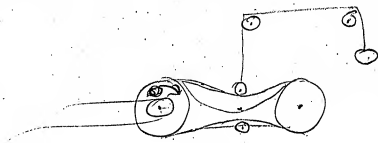
376
18
3008
376
6) 6468 1128



488
214
2952
268
1468
153282

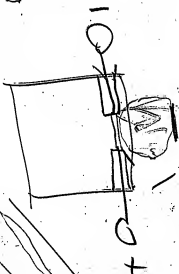






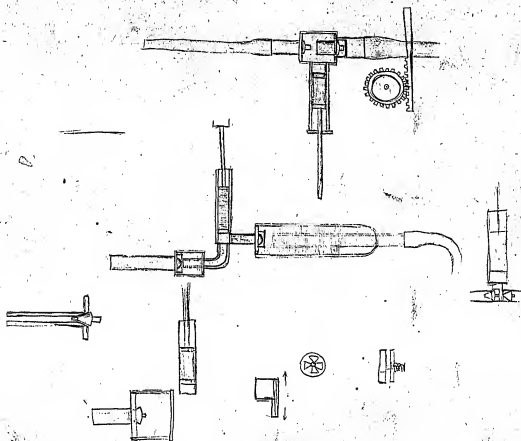
$$\frac{p}{l} = \cos \alpha$$

$$l = \frac{p}{\cos \alpha}$$



$$\begin{array}{r} 376 \\ 18 \\ \hline 3008 \\ 376 \\ \hline 900 \overline{) 6268} \quad 4\frac{1}{2} \\ 6300 \\ \hline 468 \end{array}$$

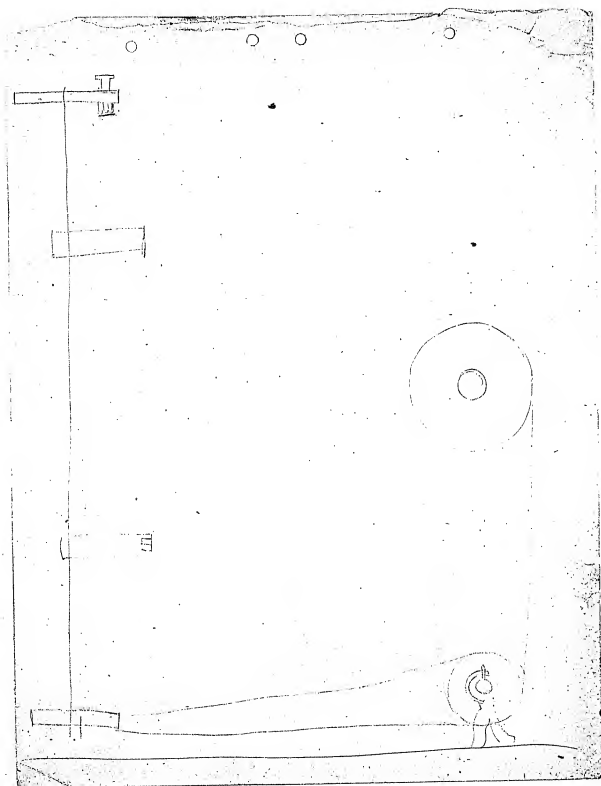
$$\begin{array}{r} 274 \\ 1880 \\ 376 \\ \hline 6156.40 \quad 94 \end{array}$$

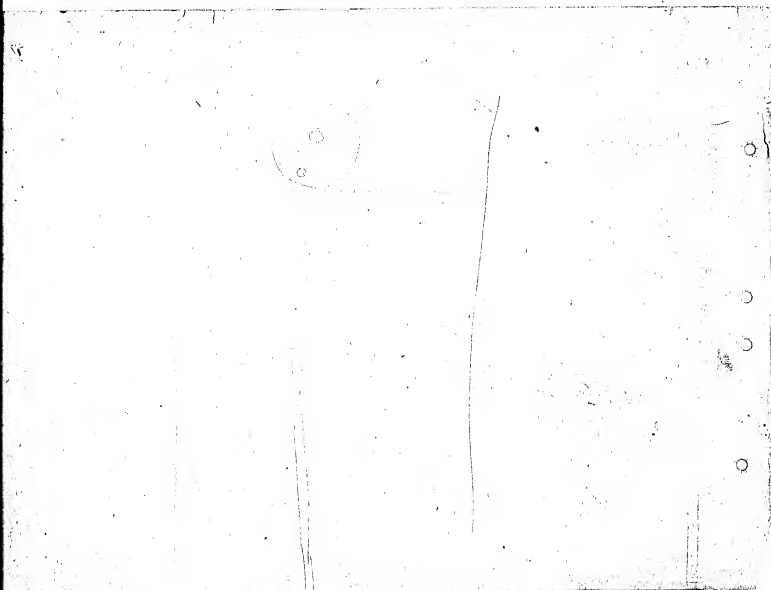


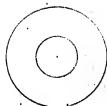
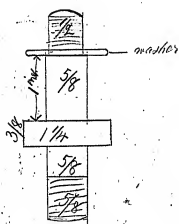
New York Thomas Edison

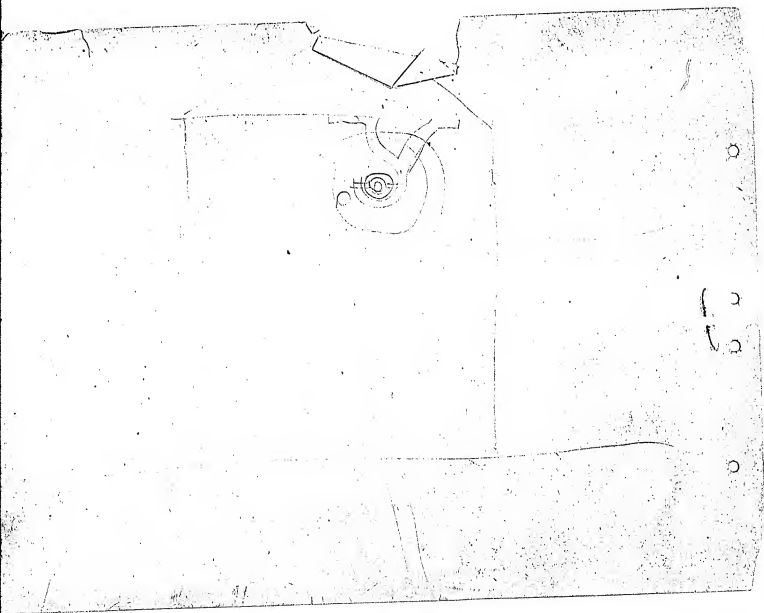
Shall you be at new Church street
to morrow and what hour -

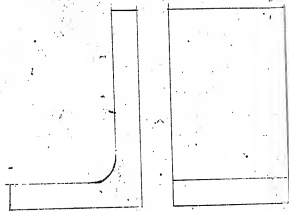
Yrs John P. Woodbury



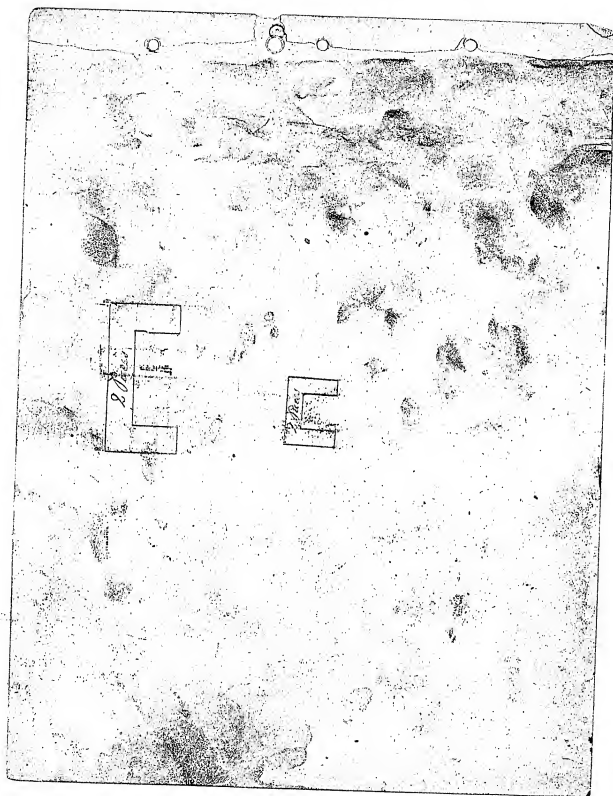


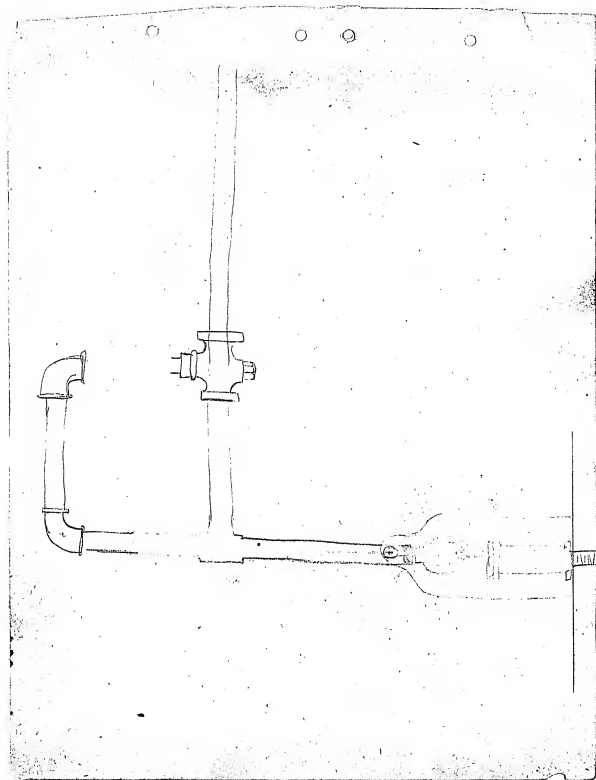


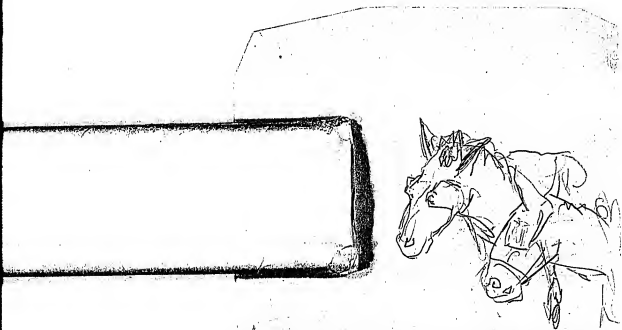




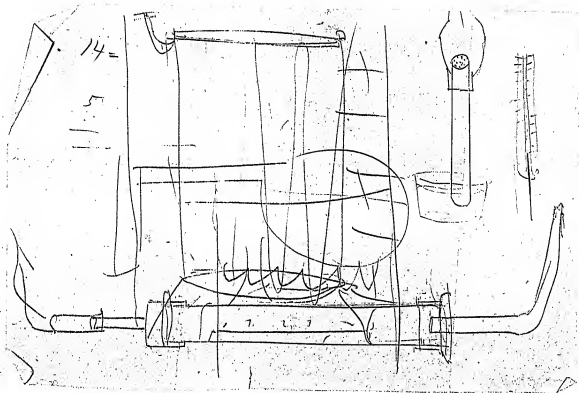
✓ 1 1 X 2 inch 1 in middle 3/8 thick L
 1 2 X 3 " 1 1/2 " " " " "
 1 3 X 4 " " " " " "
 1 2 1/2 X 5 " 2 " " " "
 ✓ 1 1 X 1 " 1 " " " 1/4 L







When shall we meet again?



Undated. Chemical (NS-Undated-002)

The object of this invention is to coat various materials especially materials which are non conductors of Electricity with metals,

The invention consists in depositing a salt of the metal upon the material to be coated by immersing it in a solution of the same in any proper menstruum, and drying the same, when it is placed ~~over a~~ ^{over} a box

Closet or other proper receptacle and within which is a quantity of mixed phosphide of Calcium or other phosphide of an element which gives off phosphuretted hydrogen when moist.

The operation is as follows; If say a silk garment is to be silvered & immersed the garment in a strong ^{hot} solution of nitrate of silver salt allowing it to remain for about one hour. It is ~~then~~ taken therefrom and thoroughly dried. It is then taken to a tight closet and suspended over a large

flat dish which is covered to the depth of
say $\frac{1}{16}$ of an inch with moistened
Phosphite of Calcium. By the action of the
water phosphuretted Hydrogen is eliminated
and the phosphorus therefrom reduces the
Silver salt to the metallic state, from
3 to 10 hours is required for perfect
reduction.

I am aware that it is not new to reduce
a Silver salt upon ~~an~~ material by
phosphorus. I am also aware that Phosphorus
dissolved in its solvents such as Ether &
Bisulphide of Carbon have been placed
in evaporating dishes in sealed jars
over which was suspended an article
containing salts of a metal to be reduced.
But the use of phosphorus in solution is
very dangerous, unreliable and it does not
penetrate within to all parts of the material
and it is besides capricious ~~with~~ and
exceedingly slow in its action.
I therefore claim as my invention.

reducing metals ^{to themselves} from their salts upon
any material by [↑] exposing the same to the
fumes which arise from ^{moist} Phosphide of
Calcium or the Phosphide of any metal
as set forth

Experiment No. 1.

Proposition.

~~Control the Blue line in a gravity~~
~~battery (Cathode modification of Daniell's) so that~~
~~the zinc should at all times be in the zinc~~
~~solution.~~

To prevent the diffusion of liquids
(sul cop & chl zinc) in a Daniell's gravity
battery.

~~It has been observed that there is a~~
~~drawback to the gravity battery which~~
~~is that the sulphate of copper~~
~~deposition causes gradually raises~~
~~after the battery has been in use~~
~~for some time, and a large quantity~~
~~of copper is precipitated on the zinc~~

When a piece of zinc is thrown
into a solution of sulphate of copper
the sulphuric acid of the

Sulphate of Copper leaves the
Copper and attacks the zinc
forming Sulphate of zinc and
~~the~~ The metallic Copper is
thrown down upon the zinc
in a spongy state and then
it will go on until the sulphate of
Copper ~~solution~~ has all been
decomposed.

In the gravity battery, this
same effect is obtained. The
Sulphate of Copper raising
up towards the zinc soon
surrounds it and the chemical
as above described takes place
which is independent of the
Electrical action; the deposition
of the spongy Copper upon the
zinc leads to local action
as well as reducing the power
of the battery by continually
altering the reducing the

difference between the two metals
 a large amount of sulphate of
 Copper ~~is~~ is decomposed
 adding nothing to the power
 of the battery, and ~~leading~~ to
 obviate ~~some~~ the effect of this
 deposition, recourse is had to
 raising the zinc up ~~to the~~ as
 far away from the sul Cap
 solution as possible,
 so that it will be immersed in
 the sulphate of zinc solution
 only this answers very well
 until a complete diffusion
 of the two liquids takes
 place, but has the disadvantage
 of increasing the internal
 resistance.

~~Have~~

In experimenting upon a large number of gravity batteries arranged in innumerable forms. I noticed that in two of the ^{which were arranged} numbers ^{in which having deposited deposits} that I had placed the crystals of blue vitriol below the copper element on the top of which was the saw dust & zinc element, and that the liquid below the element was very blue whilst the saw dust was not even colored. It occurred to me that the electric current might perform some function and thus by arranging the element and solution in a peculiar manner the diffusion of the liquids might be prevented

1 that this I ~~set~~ placed
 2 pound of blue vitriol in
 the bottom of a jar 6 inches
 in diameter by 9 high
 a little over the blue vitriol
 I suspended the Copper
 Elements which was a
 round disk 5 inches in diameter
 with a small aperture in the
 center $1\frac{1}{2}$ in diameter over
 this I suspended the zinc
 The battery was the place
 the poles of the two batteries
 were then connected together
 that remained in that way
 for ~~two~~ several months
 no diffusion after ~~two~~ $\frac{1}{2}$ years
 took place the

~~in pure copper~~
Solutions assumed a very deep
blue ~~above~~ up to contact with
the Copper Element above
the Copper Element and in
Contact with it was the Sil
Zinc Solution which was
a light yellow, The zinc
was comparatively clean and
no trace of Copper could be
discovered -

I found subsequently that
when the two poles ~~was~~
of the battery were disconnected
for a short time that the
Sulphate of Copper began
to raise and mix with the
Sil Zinc Solution but it
immediately went back
under the Copper when
the poles were connected [6]

~~I also found that the reason~~
~~of the battery could be~~
~~I also found that the reason~~

Thus proving that the Electric
 Current itself prevents the
 diffusion of the liquids

I also found that when the
 zinc was ~~pt~~ lowered down
 within $\frac{1}{64}$ of an inch of the
 Copper element that the
 Sulphate of Copper would
 return back under the Copper
 Element after it had been
 allowed to rise, in much
 less time than when the zinc
 was farther away from it
 so therefore the action of the
 current

battery is much not ~~very~~ when the two elements are very close but the internal resistance is greatly reduced. As the liquids in this battery soon diffuse it is well to employ as when they are used upon an open circuit to shunt each cup with several feet of small German silver wire.

~~With a large high jar
and changed with six or~~

This battery is perfectly consistent. The galvanic needle ~~stood in the same place~~ not varying a degree for months =

Name	Reaction	Do - Mooring	Polarization	Dik on C	Dik on H	Phenomenon
Cyanide Mercury	high	—	O. slowly on all, esp. H. M. quick on all.	—	nothing in 20,000	
Nitrate Ammonia	low	—	H. absolute darkness on all. O. dark except at. weakly on C and H. Reaction at normal temp.	—	nothing in 20,000	
Sulphate Ammonia	very high	—	O. fast on all. O. ditto =	—	nothing in 20,000	
Coal of Lithium	low	—	H. Quick on all but P. very little. O. dark on all.	Slips slightly.	nothing in 6000. Very faint on C and H. nothing in 20,000 in 10 min.	
Coffein	mod low	—	H. fast on all except on silica. O. ditto =	—	nothing	
Carbozotic Acid	mod low	—	H. fast on all. O. No but quick on silica.	—	nothing in 20,000	
Amalgam	high	Variable	H. fast on all. O. No but quick on all except silica. Reaction at normal temp.	—	nothing in 20,000	
Chloride Morphine	low	Variable	H. fast on all. O. ditto =	—	nothing	
Tartrate Magnesia	high	—	H. fast on all. O. ditto =	—	nothing	
Chloride Copper	low	Variable	H. fast on all except H. silica. O. slow on all but P. all same	—	nothing	
Chloride Potash	high	Variable	H. very fast. O. ditto =	—	nothing	
Chloride of Soda	low	—	H. fast on all. O. slow on all.	—	nothing in 20,000	
Sulphate of Soda	mod	—	H. slowly on all. O. ditto =	—	nothing	
Hydrophosphate Magnesia	low	—	H. slow on all. O. ditto =	—	nothing	Black on H on silica light brown on silica
Alum	very high	—	H. slow on all. O. ditto =	—	nothing	Yellow on H. on silica and on silica
Valerianate Ammonia	very high	—	H. fast on all. O. dark on all except at. P. the	—	nothing	
Camphoric Acid	high	—	H. quick. O. very slow except at. quick	—	get when reduced on 10,000 very the same	

[illegible]

	Resistance	Mooring R.	Polarization	Diff.	Diff. H.	
Hydrochloric Hydrobromic	Low	Even	Low	Nothing	Nothing	Paper adheres to plate on O. deficient in H. 1st test even
Gravimetric	Low	Variable	Very R. 2nd test	Nothing	Nothing	masking out with silver
Acetic Acid	high	—	Quick	Nothing	Nothing	
Mercuric Chloride	Low	—	Medium	Nothing	Medium 10 min	
Perchloric Acid	Low	—	Quick	Nothing	Medium	
Let's plant (Bismut)	high	—	Quick	Nothing	Nothing	
Phosphoric Magnesium	Low	—	Quick	Nothing	Medium 10 min	
Sulphuric Uranium	Low	—	Moderate	Nothing	Nothing on 10 min	
Phosphoric Zinc	Mod high	—	Quick	Nothing	Nothing	
Hydrochloric Barium	Low	—	Very slow	Nothing	Increases	
Indicative Zinc	Very Low	—	Very slow	Nothing	Nothing	Back up on H. 7. 10 min. 10 min
Isotonic of Ammonia	Very high	—	Medium	Nothing	Nothing	
Sulphuric Silver	Very high	—	Very Quick	Nothing	Nothing	
Chl of Propylamine	Low	—	Quick	Nothing	Nothing on 10 min	
Saponin	Very high	—	Mod Slow	Nothing	Just fast 10 min	
Nitric Methylene	High	—	Quick	Nothing	Nothing on 10 min	
Lunar Carbonate	Low	—	Insoluble	Nothing	Nothing	Back up on H. 10 min. 10 min
Chlorine acid	Low	—	Quick	Nothing	fast on 10 min	Red up on O. 10 min
Sulphuric Ammonia	high	—	Very Quick	Nothing	Nothing	

Name	Resistance	No-Mooring	Polarization	Diff. O.	Diff. H.	Phenomena
Sulphuric Endigo	Low	Even	H. 2nd test O. 1st test slow	—	Get down 20 min	
Hydrobromic Ammonia	Very low	Even	H. 1st test O. 2nd test slow	—	Get down 20 min	Quartz phenomenon on O. Quartz phenomenon on O. 10 min
Mercuric Chloride	Low	Lowest in Zn. 10 min	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Stannous Oxide	Low	Very high on all O. 1st test mod. 2nd test P. 10 min	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Carbonate	Very high	Even	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Sulphuric Silver	Low	High on all O. 1st test mod. 2nd test P. 10 min	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Acetic Iron	Mod high	Lowest in Zn	H. 1st test O. 1st test	—	Increases	
Picric Ammonia	Mod high	Lowest in Zn	H. 1st test O. 1st test	—	Nothing	
Sulphuric Ammonia	Mod high	Even	H. 1st test O. 1st test	—	Get down 20 min	
Perchloric Potash	Low	apparently Even	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	Slips	Nothing	
Tungstic Ammonia	Very high	High on all O. 1st test mod. 2nd test P. 10 min	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Sulphuric Ammonia	Very high	High on all O. 1st test mod. 2nd test P. 10 min	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Sulphuric Magnesia	Mod low	Lowest in Platinum	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Lupulin	high	High on all O. 1st test mod. 2nd test P. 10 min	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Valerianate Zinc	Low	Zn high	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	Slips	Nothing	
Chloroacetic Acid	Low	apparently Even	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	
Stannous Ammonia	high	Even	H. 1st test mod. 2nd test P. 10 min O. 1st test mod. 2nd test P. 10 min	—	Nothing	

Name	Resistance	Do moving	Polarization	Def. O.	Def. H.	Remarks
Chl Uranium	Low	—	Very Quick	—	Real thing 10.000	
Iodic Acid	Low	—	Quick	—	nothing bright 10.000	fast mks on H. blue;
Permangan. Brom	Low	—	Instant	—	nothing	
Iodide Ammonium	Very Low	—	Quick	—	9.000 = 9.000	Iodide mks on O.
Valerianate Potash	Low	—	Quick	—	Real mks 10.000	fast blue mks on O.
Nitrate of Uranium	Low	—	Quick on H.	—	nothing on 10.000	Short yellow mks on H.
Uric Acid	Low	—	Quick	—	nothing	
Pepsin	Very Low	—	Very slow	—	weak but keep on 10.000	
Formic acid Pot	Very Low	—	Exceptionally slow	—	nothing	Blue mks on O. nothing strong
Phosphate Potash	Low	—	Expands in place. Extremely slow	—	no good - with pump. Very slow	
Thymate Soda	Very Low	—	Quick on all but Tin & Platinum - apparently none mks	—	strong on 10.000. But on most that pass slow	
Chl Nickel	Low	—	Instant	—	nothing	
Bismutate Potash	Low	—	Quick	—	just get it 10.000	
Sulfate Calcium	Low	—	Very slow - X. Not mks. probably in. insoluble	—	nothing	alk mks on H. in form
Formic Soda	Low	—	Platin. None - is diff. all others	—	weak on Plat. but on Nickel & Zinc	Red of plat. very greater
Loche of Zinc	Low	—	Quick	—	nothing	Aluminum

Name	Resistance	Do moving	Polarization	Def. on O.	Def. on H.	Phenomenon
Borate of Sodium	high	Even	H. gk mks but P. & H. Arise	—	get on 600.	
Picric Acid	Med Low	Even	H. gk mks on all O.	—	nothing	
Carmine	high	—	H. Instant. O. slow	—	nothing	Bleach Calom. on O.
Protosulfate Copper	Low	P. low all high	H. fast on all O. little	—	nothing	
Nitrosulfate of Soda	Low	P. low in mks. all high	H. fast on all O. slow	Increases	scarcely visible on 600.	
Iodide of Zinc	high	Even	H. gk mks on all O. slow	—	nothing	
Sulfate Calcium	high	Even	H. fast specially in solution O. fast	shorten exposure when fast 10.000	nothing	Longer fraction of ppt exceedingly small
Acetate Chromic	Low	M. high P. low	H. quite slow. O. little fast	600 Slips strongly	But little mks. Nothing on 20.000	
Iodide Calcium	Low	Even	H. gk mks on all O. fast	—	nothing on 20.000	
Guanadine	high	P. low all high	H. fast O. fast	—	600 Very strong on 20.000	
Sulfate Barium	high	Zn & P. low Aluminum high	H. fast O. fast	—	600 Very strong on 20.000	

	10 000	20 000	30 000	40 000	50 000
Chl Uranium		fecl			
Tobacco ammonia		get it			
Vanilic acid Potash		fecl ok			
Phosph		weak but sharp			
Phosphate Potash		good with am			
Triglycidol		good but slightly			
Microscopic salt		medium			
Phosphate Manganese		medium sharp			
Saponin		just fecl			
Choline acid		just fecl			
Ortho Potash	slimy				
Parate Potash	slimy	str	strong	strong	
Phosphate Soda					
Dichromate Potash		slimy			
Gum arabic			W.		
Leucase	Enormous		Very slimy	strong	
Cochineal	Enormous		Very slimy	get it	
Campfire acid				hardly not strong but in 2000	
Acetate Hydrate Potash				get it from	
Acid Soda				Very strong	Very strong
Ammonium Potassium		good	slimy		
Aluminum Potash			good		
Ammonium Ammonium				strong	
Carbonic Potash			get it		
Hydrochloric acid			very slimy	quite strong	
Calc magnesia					

Solution	Co. Chus	20-0-0 Chus	40-0-0 Chus	Phenomenon
Sulphate Ammonia	Good	Nothing -		Only somewhat slight mark on 20-0-0 Chus.
Pot. Chloride & Sulph	Strong Inc.	Very strong Inc	Not so strong -	Slips on C
Sulph. Bicarbonate	Strong	Just somewhat strong		This mixture was at - up to 100° from boiling water on C. Boiling water
Uric Acid	Weak	Inc. Ammonia	No. 1000 -	Inc. Fr. on C. In warm water, on C. Boiling water
Magnesia	Weak	Weak		
Phosph. Potassa Acid	Ex. Strong	Fair on S.T.C.		Strong Fr. on C. at moment of boiling
Ammonia Mercury	Ex. Strong	Barley Sat. it		
Antifluoric Potash	Ex. Strong	Reveries water on C. In boiling water strong	Still more increased.	
Phosph. Magnesia	On C. strong	—	Fair	Fair on C. HX
Chloride Magnesia	Strong	Scarcely -		Inc. Fr. on C.
Carbonic Acid	Weak	Scarcely -		
Hydrochloric Acid	Very little	Just feel it		
Calc. Bromine	Weak	Feel it.	Weakly as strong	
Sulph. Potassa	On strong	Fair.	Fair -	
Sulphuric Acid	Strong	Fair	Weak -	Slips on C
Sulph. Potassa	Ex. Great	On strong	On strong	
Ammonia	Ex. Strong	Ex. Strong	Ex. Strong	As good as solution of Magnesia
Ammonia	Ex. Strong	Ex. Strong	Ex. Strong	Not on C.
Ammonia	Ex. Strong	Ex. Strong	Ex. Strong	Not on C.
Ammonia	Ex. Strong	Ex. Strong	Ex. Strong	Not on C.

Solution	Co. Chus	20-0-0 Chus	40-0-0 Chus	Phenomenon
Sulphate Ammonia	Good	Nothing -		Only somewhat slight mark on 20-0-0 Chus.
Pot. Chloride & Sulph	Strong Inc.	Very strong Inc	Not so strong -	Slips on C
Sulph. Bicarbonate	Strong	Just somewhat strong		This mixture was at - up to 100° from boiling water on C. Boiling water
Uric Acid	Weak	Inc. Ammonia	No. 1000 -	Inc. Fr. on C. In warm water, on C. Boiling water
Magnesia	Weak	Weak		
Phosph. Potassa Acid	Ex. Strong	Fair on S.T.C.		Strong Fr. on C. at moment of boiling
Ammonia Mercury	Ex. Strong	Barley Sat. it		
Antifluoric Potash	Ex. Strong	Reveries water on C. In boiling water strong	Still more increased.	
Phosph. Magnesia	On C. strong	—	Fair	Fair on C. HX
Chloride Magnesia	Strong	Scarcely -		Inc. Fr. on C.
Carbonic Acid	Weak	Scarcely -		
Hydrochloric Acid	Very little	Just feel it		
Calc. Bromine	Weak	Feel it.	Weakly as strong	
Sulph. Potassa	On strong	Fair.	Fair -	
Sulphuric Acid	Strong	Fair	Weak -	Slips on C
Sulph. Potassa	Ex. Great	On strong	On strong	
Ammonia	Ex. Strong	Ex. Strong	Ex. Strong	As good as solution of Magnesia
Ammonia	Ex. Strong	Ex. Strong	Ex. Strong	Not on C.
Ammonia	Ex. Strong	Ex. Strong	Ex. Strong	Not on C.
Ammonia	Ex. Strong	Ex. Strong	Ex. Strong	Not on C.

Solution	600	10,000	20,000	40,000	Phenomenon -
Chloride Magnesia	Scarcely any		Nothing		Slips slightly on G
Fluoride of Sodium	Very Great		Very strong	Very strong	Slips quite strong on G
Nitrate of Lime	Strong		Nothing		Slips slightly on G
Sulphuric	Weak		Slight on Pbl only		No Friction on G
Chlorate Soda	Very Great		Quite strong	Very fair	See Friction on G
Bi. Chloride Mercury	Great		Quite strong	Get it on middle	
Salicylic	Great		Quite strong	Quite strong on zinc only	
Pot. Phosphate Soda	Ex. Strong		Good	Rather weak	
Phosphate Calcium	Moderate		Nothing		
Chloride Barium	Moderate		Moderate	Moderate	Cent. 20% fine stream on G
Hydro. Bromine & Water	Great		Get it		
Chloride Lead	Offhand		Get it		
Sulph. Ammonia	Great		Get it	Rarely Get it	
Nitric Acid	Great		Quite strong	Get it plainly	No Friction on G
Chlorate Soda	Great		Fair		
Tartrate Potash	Strong		Get it	Probably Get it	
Phosphate Lime	Weak		Fine on Silver		
Acetate of Lime	Of strong		Quite strong	Quite strong	

Solution	600 ohm	20000 ohm	40000 ohm	Phenomenon	(Paper support. to lead)
Cuprous Soda		Really Good	Very faint -	slip strongly on G	
Cuprous Potash	Fairly strong	Just feel it			
Chloride Potash	Strong	Ex. strong	Strong -	Slip. G. strong on G	
Chloride Magnesia	Great	Strong	Weak, as strong	Slip on G	
Chloride Potash	Strong	Fair	Get it & it -	Slip on G	
Chloride Potash	Very strong	Strong	Just get it -		
Chloride Potash	Weak	Fair			
Chloride Potash	Strong	Fair -	Get it		
Chloride Potash	Mod. strong	Just get it -			
Chloride Potash	Big	Get it			
Chloride Potash	Big	Just get it			
Chloride Potash	Strong	Get it			
Chloride Potash	Big	Just feel it			
Chloride Potash	Big	Fair	Feel it	No friction on G	
Chloride Potash	Strong	Get it on G, P & B			
Chloride Potash	Fair	Strong on G			
Chloride Potash	Of strong	Of strong	Just feel it -		
Chloride Potash	Ex. strong	Ex. strong	Ex. strong -	13 class. Pot. Nit	

Take out the Gum & the first
 would probably slip - but not
 on the photograph. where
 doubtless some other element
 than mere "Kich" is at play.
 What is it.

W. H. Miller



Resistance with polarization

1	5	20	40
860	780	621	580

Temperature $\text{---}^{\circ}\text{C}$
Room $\text{---}^{\circ}\text{C}$

Condition darkness

Sensitive Ammeter
in day through - show
with 1 cell battery

Polarization - Cell P Electrode

Closing	1	5	20	40
Swing B	41	47	49	52
Swing M	280	271	293	312
Opening		58		
Swing B	46	49	53	59
Swing M	284	287	289	286

Chloride Lead.

Res in ohms:
Polysynth $\frac{10}{20}$ sec
Rec'd of P Closing
Rec'd on Opening

Centimeters

Centimetre			
1	5	20	40
820 60	791 60	440 60	308 60
_____	_____	_____	_____
Constant 1000 ohms, distance			
1	5	20	40
16 60	24 60	16 60	12 60
_____	_____	_____	_____
Light shining			
16 60	24 60	16 60	12 60
_____	_____	_____	_____
Heat from 62 2000			
16 60	24 60	16 60	12 60
_____	_____	_____	_____
Heat 82			
16 60	24 60	16 60	12 60
_____	_____	_____	_____
100			
16 60	24 60	24 60	24 60
_____	_____	_____	_____
16 60	24 60	24 60	24 60
_____	_____	_____	_____

$\frac{16}{60}$	$\frac{21}{60}$	$\frac{45}{60}$	$\frac{34}{60}$
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<div style="display: flex; justify-content: space-between; align-items: center;"> star 150 in darkness </div>			
$\frac{17}{60}$	$\frac{24}{60}$	$\frac{26}{60}$	$\frac{28}{60}$
<u> </u>	<u> </u>	<u> </u>	<u> </u>
	$\frac{35}{60}$		
	<u> </u>		

Strip, darkness

date	$\frac{24}{60} \text{ c}$	$\frac{26}{60} \text{ o}$	$\frac{27}{60} \text{ c}$	$\frac{27}{60} \text{ o}$	$\frac{16}{60} \text{ c}$	$\frac{26}{60} \text{ o}$	$\frac{41}{60}$
------	---------------------------	---------------------------	---------------------------	---------------------------	---------------------------	---------------------------	-----------------

strip in light			
$\frac{29}{60} \times \frac{50}{50} = \frac{29}{60}$	$\frac{29}{60}$	$\frac{26}{50}$	$\frac{24}{50}$
			Aluminium

Strip 80 gram weight: Platinum on ^{original} aluminum				
$\frac{20}{80} \text{ c}$	$\frac{30}{80} \text{ c}$	$\frac{40}{80} \text{ c}$	$\frac{50}{80} \text{ c}$	$\frac{60}{80} \text{ c}$
_____	_____	_____	_____	_____
_____	_____	the diameter	_____	_____
$\frac{10}{80} \text{ c}$	$\frac{20}{80} \text{ c}$	$\frac{30}{80} \text{ c}$	$\frac{40}{80} \text{ c}$	$\frac{50}{80} \text{ c}$
_____	_____	_____	_____	_____

Residue, prolonged,
Swing of Arrow clearly
Record on chemical paper on clay after full
Record " " opening.
Swing of Arrow " on opening
ditto again.

ditto again:

mean.

ditto with light

3 times

mean

ditto with heat

3 times mean

ditto with magnet

3 times mean

ditto with light magnet

3 times mean

ditto with heat magnet

3 times mean

ditto with light heat & magnet.

3 times,

ditto in sand bath,

At it remains several days

3 times mean

H.

ditto in nichel

3 times mean

ditto aluminum

3 times mean

ditto Zinc
3 times mean

ditto Tin

3 times mean

ditto Phosphorus

3 times mean

ditto Silver

3 times mean

ditto Copper

3 times mean

ditto Lead

3 times

on C.

ditto aluminum

3 times mean

ditto Nickel

3 times mean

ditto Zinc

3 times mean

ditto Tin

3 times mean

ditto Phosphorus

3 times mean

ditto Silver

3 times mean

ditto Copper

3 times mean

ditto Lead

3 times mean

ditto with ship

3 times mean

ditto with ship & light

3 times mean

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Note For the boxes at lower temperatures see
Tables 104 & 105

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[illegible]

T. A. EDISON.

Menlo Park, N. J., 187

Faraday

Impurest semi-conductors.

Platino.

Sulphuret Molybdenum

Tin pyrites.

Sulphuret Silver.
at low temp. some at
all a very good insulator at high temp.

Fluoride Lead.
at 900 F.

Chalk.

Many minerals.

T. A. EDISON.

Menlo Park, N. J., 187

Faraday

Conducting Compounds:

Insulin 311. Vol 1

Thermo battery single pair

Sulphuret Bismuth

Gadolin

Scale oxide iron

Protophosphat Iron

Iron pyrites

Iron pyrites

Copper glance

Artificial disulphuret Copper

Purple Copper

moderately good

peroxide Manganese

peroxide Lead

Insufficiently

Blende

Tinstone

Protophosphat Tin

Magnetic iron ore

Speckle Iron

Wolfram

Suboxide Copper solidified after fusion

Red oxide Mercury

Cinnabar

R. W. Fox. Free Quaker 710 Vol 1

Copper nickel

Purple Copper

pyrites

Copper glance

conduct well.

Diminishing in power

Iron pyrites

Iron pyrites

Gadolin

Iron pyrites

peroxide Manganese

Tourmaline

Faraday

Conductivity of fused Salts

Name	Melting point	Conductivity
Chloride Lead $Pb Cl_2$	580° C	32.200
Nitrate Soda $Na NO_3$	314° "	11.475
Nitrate Silver $Ag NO_3$	"	8688
Chloride Sodium $Na Cl$	960	8660
Potassic Potash $K NO_3$	342° "	6500
Sulphate Soda $Na_2 SO_4$	1280	3680
$Sr Cl_2$	910	2260
Carbonate Potash $K_2 CO_3$	1180	2100
Chloride Zinc $Zn Cl_2$		86

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T. A. EDISON.

Menlo Park, N. J.

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Conductivity of fused Salts.

Name	Melting point	Conductivity
Chloride Lead $Pb Cl_2$	580° C	91,850
Nitrate Soda, $Na NO_3$	314° C	52,580
Nitrate Silver, $Ag NO_3$	" C	28,090
Chloride Potassium $K Cl$	866° C	57,760
Chloride Sodium $Na Cl$	960.	28,020
Potassic Potash $K NO_3$	342	23,340
Sulphate Soda $Na_2 SO_4$	1280	14,050
$Sr Cl_2$	910	8,700
Carbonate Potash $K_2 CO_3$	1180	8,810
Chloride Zinc $Zn Cl_2$		86

Journal Chem Soc 996 (1976) Pogg Ann. cliv 161-196.

Results of M.M. Wiedemann + Franz's investigations as to conductivity of metals for electricity + heat. Extracted from Tyndall's "Heat as a means of Motion" page 224.

Name of substance	Conductivity	
	for Electricity	for Heat
Silver	100	100
Copper	73	74
Gold	59	55
Brass	22	24
Iron	23	15
Lead	13	12
Lead	11	9
Platinum	10	8
German Silver	6	6
Bismuth	2	2

— A Richer^d C. Bardy —

Photogenic power of flame.—

Oxyhydrogen light — 1 —

Drummond " — 3 —

Zinc burning in Oxygen — 4 —

Magnesium lamp — 5 —

Current of Nitrogen Dioxide in a flask containing

Carbon disulphide — 6 —

Jet of Nitrogen Dioxide on a cupel containing

Carbon disulphide — 6 @ 7 —

Jet of Oxygen on a cupel containing

Carbon disulphide — 7 —

Jet of Oxygen on a cupel containing Sulphur — 8 —

In Telegraph and physical laboratories it is usual to employ for recording currents by chemical decomposition upon prepared paper an iron point the paper being moistened with a solution of Ferrocyanide of Potassium, and I find that this salt is invariably ^{now} recommended in all text books referring to the subject. The results are ~~some~~ invariably unsatisfactory. I have found that no matter what ^{oxidizing} metal is employed for the recording point, the protoxide is invariably formed by electrolysis, and of course to obtain the best results the reagent for that oxide must be used which with an iron point is not the ferrocyanide but the Ferricyanide of Potassium. The best proportion is one ounce of the ~~reagent~~ ferricyanide, one pound of the chloride of sodium and ^{one gallon of water} C. J.

the Chloride of sodium being used to increase the conductivity of the paper, if more a greater quantity of the Ferricyanide of Potassium is used a prolongation (and if to in great quantity) a weak cathodic mark is made upon the paper due to the fact that the Ferricyanide of Potassium is an ^{oxid}izing salt and salt and oxidizes the iron part of the independent of the current & but if Counter Currents be used this effect is not apparent, polarization of the points by Hydrogen takes place, & preserves it from oxidation. The paper used must be free from iron and animal size although the ferricyanide of Potassium will be reduced to the Ferrous.

Coloring the paper blue by combining with the iron of the paper which is unavoidable a high oxide, and at the same time reducing the quantity of the active reagent. This solution is very economical and sensitive for ^{quantitative} Pictographic purposes, but is unsuitable for accurate work insofar as it does not give a true record of the passage of the current, in fact no accurate record can be made unless the coloration is made dependant of the action of Hydrogen, a process which I will presently describe.

As a reagent for the ferric salts of iron, the Sulpho Cyanide of Potassium ^{greatly} exceeds in delicacy all others and I have endeavored to employ it as a reagent for the oxide, ~~but~~ to 100 cc of dissolved water I add 1 gram of Chloride of Calcium + ~~some~~ mls of Sulpho cyanide of Potassium + 1 mls of the Prussian blue of iron, after no reaction takes place between the iron salt & the sulphocyanide if strips of paper be maintained in the solution and allowed upon passed through the chemical recorder and the battery so connected.

that oxygen will be evolved on a platinum point, the proto and salt of iron will be raised to a higher ^{state of} ~~oxidation~~ and the sulpho ~~compound~~ ^{reagent} will combine to form the ~~blue~~ red diphenyl of iron, but this coloration is transient but of great delicacy. 2 Bunsen Cells giving readable Morse signals at 20 words per minute through ~~shunt~~.

When iron recording points are used, they soon become rough and tear the paper, and thus requiring them to be smoothed with a file every few minutes. Especially if the paper is quite moist, and this is moved slowly forward, and on this account I have endeavored to replace the iron point by some other metal, still retaining the iron salts and their reagents but not very successfully, owing to the tendency of the salt to decompose when exposed to the air. If Ferridiazoxide of potassium be added to a solution of Ferric chloride of iron, no reaction takes place, if now the recording point is made ^{which does not become rough by rubbing} ~~transmits the current~~ of tin, peroxide of tin will be formed and this being a powerful reducing agent will reduce the Ferric chloride to a lower state of oxidation & this will combine with the Ferridiazoxide to form Turnbull's blue. ~~The trouble with the sulpho compound is that it gives in light blue from change of color when exposed to light. The paper of the pen is turned blue when exposed to the light.~~

Table of delinquency
 Palladium, Ruthenium, Rhodium, Iridium, Osmium, Platinum, Gold, Silver, Copper, Nickel, Cobalt, Iron, Zinc, Cadmium, Lead, Tin, Antimony, Arsenic, Bismuth, Manganese, Barium, Strontium, Calcium, Magnesium, Potassium, Sodium, Lithium, Ammonium, Hydrogen, etc.

TAE

Try Chloride Mercury = tin pen
may be colored paper

Molybdenum pen. to zinc of salt
& sulphocyanide. put - dilute

Tellurium pen try. ^{Ind. of potassium} Sulphate Soda ^{or} ^{or} ^{or}
or potassium chloride tin. These pens
Tellurium to metallic slate.
also Carb Pot.

Selenium pen better to zinc & Copper
Hydro sulphuric A & Hydrochloric A
also potassium tin

Chl Barium. Sulphurous acid
Platina pen. Oxygen later Sulphuric
to Sulphuric A & persulf white.
use another black paper.

Sulphurous O. Sugar. platinum pen (1887)
Coke - Extra 0x49 en make ours 10
when sugar is charred black. plenty
sugar

Phosphorus Water Silver pen
also by phosphate salts with silver pen

Iron pen. phosphate acid. least
possible excess of nitric acid, & large amount of acetic acid.
— & yellow white gelatinous
pen can may raise nuff to break ckt
may be red when current strong

Binoxide or protoxide antimony, nitrate
silver & hydrate Pot or Soda,
platinum pen. to Carb. Black.

(also ~~peroxide~~ antimony ^{pen} soda. caustic
soda. nitrate silver & soda zinc to pen
Try nitric acid
" permanganate pot
" Bichrom
" chlorate pot
Good but not so good as yellow

Chloride of mercury is a test for proto of tin
delicate, if percip which is consaluable be
white use colored paper =

Amichlso^s chlso^s & little Nbric A to
increase delienary,

Nickel Salts are discolored when come in
Contact with water -

Cobalt per - Sulphide Amom percip from neutral
Sols & Hydrosul a from Alkaline Sols. The proto
as usual Black hydrated Cob., Chl Ammon
greatly assists, —

See if Chl Sod or Am assists ferred to detect
minute quantities of protosulphate ion,

Make print new sol.

sol. chl. iron, ferrid. salt & ~~conc~~ tin pen

Platinum pen - ^{add sulphuric or arsenic soln. ~~tellurium~~ also Zinc} Antimony Salts & acid
Try - Ferric best. liberation of hydrogen
leaves Black ^{chromic} of antimony on platinum
pen - insol - Fresenius p 161. Try
both Positive & neg paler Zinc Blk. ^{with tellurium}
Ferric antimony Nitrate to convert
Praseo ^{green} to a Nitrate. Silver pen
Blk persulphate (very green) by adding ammonia
one of the oxides dissolves.

Try Bunsen battery with Ferric oxide
of antimony in place Sul acid
also with both Ferric oxide & oxides
Zinc rapidly.

Tin pen: chl pal or chl wat. & Concentrated
sulphate ~~potash~~ soda.

Can Pat - ~~best~~

Common salt gives Blk ink with zinc ^{spec}
tellurium pen - ~~green~~

Hydrogen is ⁵¹¹⁰ sensitive test
for letterman pen
Corn Salt or
Caustic Pot best
Carb Pot good

Aniline treated with Sul. A. & oxidized
with platinum pen gives Egyptian
midnight black mark after a
time =
prob sulphate of aniline, will answer

Bismoxide tin

it is the n
"Chimeracy is best for pralochelatin -
Black inky precip - (See very)
Note refer to other record list

Copper pen
~~Platinum pen~~ - grape sugar ~~and~~ caps -
~~but~~ it makes the proto to a
Sub ox -

Bism oxides & Platinum pen =
get a soluble protox lead - platinum pen
& a manganese salt = Electric oxigen
turn proto lead to Bism lead &
perox mang

Ferrocyanide SoS will do all ferro pal
will so will ferrousodium make or by
some

Cyanide lat, excess to proto solution or
protochlor non burnt & Oxymur line
turn it to a ferri - iron pen -

Coloured paper chloroaurum - Sulphuric acid
platinum pen - electric atom of
added to fresh sulphuric acid make
it a sul a & white perox

Platinum pen Molybde A or Molybdate
^{slut} Hydrochloric Sol. ^{yes 95.50.} prob not necessary add
strong Sol Sulphocyanide & Kali
Liberalism of Hydrogen gives Carmine
Color (very very sen) Postum &
Negative pales, latter =

Tungstate Salts = tin pen - mixture
acidified by Hydrochloric ^a ~~or phosphoric~~
prato tin gives blue or yellow Green

Tellurium Salts - Tin pen. BLK works.

Praseodymium iron. ferro iron pen,
forms Brn ox. also Sulphocyanide -
to make praseodymium boil Sulphuric Soda
with sugar till latter colorless,

Presidium 212-5

^{Cr₂O₃ 95.50}
Sol Soda Lead pen - Hydrosulphuric

Iron pen Chl⁹al² Sul acid.
Blk precip - f 262

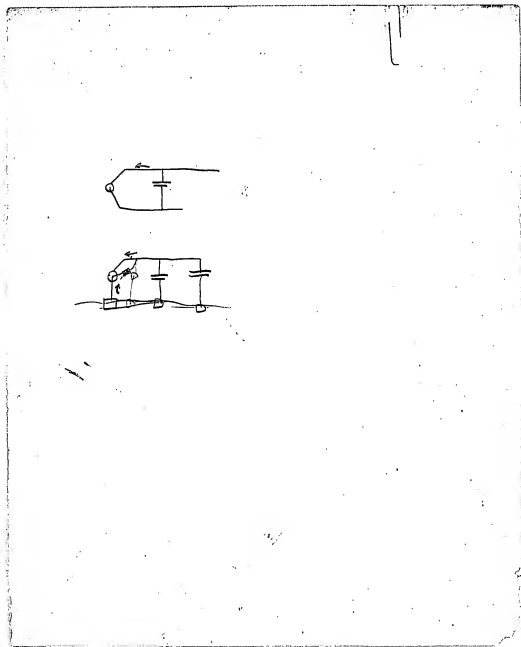
Get some Morphine -
Neutral resgn chl impart dark Blue
Col (Sen)

Presens 397 398 - good
get Ammonia

If strychnine is oxidized it assumes
a magnif Blue violet color, which
gets dirty after time - platinum pen.
- 401

Prussian. Concentrated Nitric A also
diluted with water proto has change
it from intense red to intense Violet
Sen

Binoxide of Soda - Palash - tin pen
Tumeric. Dahlia or ~~Salmon~~ ^{go over}
Binoxide is not alkaline but peroxide
the reduce Bin to peroxide & the
Soda becomes alkaline & leaves mark



Ferro- chl potash- possibly salt,
 Chlorate sesquioxides the Electro-prot oxide And
 Ferro strikes a Prussian Blue = also try
 other oxidizers Chromate Potash - Nitro a.
 Permanganate Pot =

H_2O Guac Caustic potash - Tartaric acid
 probly chl Ammon or chl Sal. - Tartaric a
 to prevent ^{pot} redissolving Guac Mark

Chlorine ^{or chloride} sesquioxides a protoxide or chl
 hence chl Sod. in Chlorine Water, and
 Ferrocyanide Pot =

chl Pot. Hydrochloric a ferro chl Sod - turn to ferric

Put hard rubber shavings in a stream of
 Hydrogen to desulphurize it by making
 Sulphuretted Hydrogen try Kerite. } Bradley,
 Whiskey

Sulphide Ammon peraps proto to black hydrated
 proto sul Iron, which gradually oxidizes, in air
 hence add ~~lat~~ proto-chelatin, Chl Amn greatly
 assists, pbl chl sod / 12, but not iron, 'be alkaline'.

Try. protosulphate iron; potash or ammonia &
 platinum pen; extra oxygen makes proto a higher
 oxide & potash gives a red brown color

Molybdenum pen. oxidizing aqt to give a
 sesquiox of Molybdenum & then Sulpho Cyande
 of Pot gives red color

Try Chlorine water proto & Sulpho cyande Pot
 Chlorine W Converts proto of a sesqui chl iron,

Uranium pen Xenro Kali very sens test
 red brown perap;

Sulphur Ammon del test, Chl Amn assists cross

Vanadium, ferro test sulphid Amm.

Thallium, Hydrosulphuric A for alk line Sol.
Hydrosulphuric Amm from Neutral Salts -
Chromate Pat gives yellow - Bichrom deep orange
precip insol water & acids, Godpat very
Sen. Reagent gives God Thal. which insol
in either water or excess reagent - Try

Palladium in gen Test use Hydrosulphuric A. & do phos
ammonia, Black very insoluble God pat
Blk protosulphide pal, (Sen)

Ruthenium - - Potash = Blk. ox - insol alkalis -
Hydrosulphuric Am. blk ox sol in exes - Sulphocyanate
red gets violet (Sen)

Uran Chloride the per salt & chlor water so
as to have mixture of Proto & Bichl. the,
(Very Sen). Try tannic A in various ways.

Wormwood
 X Gum Arabic
 Vinegar
 Aconite leaves
 Aconite Root
 Card
 Star Grass
 Garlic
 Cloves
 Marshmallow flowers
 " leaves
 " Root
 Ammoniac Gum
 Bitter Almonds
 Sweet Almonds
 Marsh
 Will Seed
 Angelica
 Garden Angelica
 Angelica Bark
 Anise
 Chamomile
 Dags Bane
 Indian Hemp
 False Sassafras
 Angelica Tree-bark
 Horse-mulch
 Leopards-bane
 Dragon Root
 Canada Snake root
 Flesh-Colored Asclepias
 Common Silkweed
 Butterfly weed
 Asiofilida
 Orange Peel
 Oatmeal
 Tycharach
 Balsam of Peru

Balsam of Tolu
 Belladonna
 Benzoin
 Buchu
 Sweet flag
 X Camphor
 Canella
 Cana Marsh
 Spanish flies
 Palate flies
 Cayenne Pepper
 Cardamom
 Carrot Seed
 Garden Carrot root
 Lyons Saffron
 Caraway
 Cloves
 Cassia
 Purging Cassia
 American Senna
 Chinguapin
 Castor
 Catnap
 X Catechu
 Com Anapin Contamy
 White Wax
 Yellow wax
 X Spermoceti
 Iceland Moss
 Wormseed
 Pissarscwa
 Chiretta
 Irish Moss

Black Snake Root
Peruvian Bark
Cinnamon
Cocculus Indicus
X Cochineal
Colchicum Seed
Calocynth
Columbo
Heiloch Linner
" Seed
Contrayerva
Wild. Palato
Copaiba
Gold Thread
Coriander
Round Leaved Dogwood
+ Dogwood
Swamp Dogwood
Mayweed
Oreocete
X Saffron
Cubebs
X Tumeric
Quince Seed
Cumin Seed
Larkspur
Foxglove
Pewee
Stunk Cabbage
Bitternut
Elaterium
Elemi

2
Engel
Canada Fleabane
Philadelphia "
Button Snakeroot
Erythronium
Thoroughwort
Large flowering Spurge
Spicebush
" "
Euphorbia
Extract of Hemp.
Liquorice
+ Wheat flour
Figs.
Male Fern
Fennel Seed
American Columbo
Galbanum
Galls
X Gamboge
Partridge Berry
Geniten
Blue Geniten
Cranesbill
Water Asens
Gillenia
Liquorice Root
Pomegranate Rind.
Bark of pomegranate Root.
Guaiacum Wood

X Guaiac

X Logwood

Pennyroyal

Fraserwort

Black Hellbore

Indian Sassaaparilla

Liverwort

Masterwort

Alum Root

Lee Barley

Hops

Hempbane Leaves

" Seed

Sunglass

Elecampane

Ipecacuanha

Horsetail Ervris

Blue Flag

Xalap

Ballastnut

Juniper

Red Cedar

Rino

Rhatany

X Litmus

Aethusa

Lactucarium

3
Acrio Lettuce

Burdock

Cherry Laurel

Bay Berries

Lavender

Lemon

Lemon Peel

Flax Seed

Purgina Flax

Tulip Tree bark

Lobelia

Lupulin

Buglewood

Magnolia

Common Mallow

Manna

Arrow Root

Horchound

X Mastich

Matico

German Chamomile

Honey

Balm

Peppermint

Spearmint
 Backhrian/
 Megaron
 Horsemint
 Mulberry Juice
 Musk
 Cowhage
 Nutmeg
 Conchili Oil Nutmeg
 Mace
 X Myrrh
 Nux Vomica
 Oil Almonds
 Oil Billa Almonds
 Oil Bergamot
 Natofoat Oil
 Caput Oil
 Oil Annamom
 Oil Lemon
 Filaxacid Oil
 Cod Liver Oil
 Oil Nutmeg
 Olive Oil
 Castor Oil
 Oil Roses
 Bonne Oil
 X Oil Turpentine

Croton Oil
 Opium
 Oreganum
 Gengseng
 Poppy heads
 Pareira Brava
 Petroleum - Grude
 Paralely Root
 Poke berries
 " Root
 Pimento
 Black pepper
 Long "
 Pitch
 Burgundy Pitch
 Canada Pitch
 Tar
 May Apple
 Bitter Polygala
 Black Alder
 Prunus
 Wild Cherry bark
 European Pennyroyal
 Pellitory
 Quassia
 White Oak bark
 Black " "

Crowfoot

X Resin

Buckthorn Berries
Juice

Phulbari

Red Poppy

Rumach

Dog Rose

Hundred Leaved Rose

Red Roses

Rosemary

X Madder

Blackberry Root

Blunt Leaved Dock

Rue

Cevadilla

Amu Centaury

Savine

Malassia

Brown Sugar

Maple Sugar

Sugar of Milk

Sagapennum

Sago

Willow

X Sage

Elder flowers

Bloodroot

Red Saunders

Soft Soap

Sarsaparilla

Sassafras Pitt

Sassafras Bark of Root

Scammony

Squill

Seneka

Senna

Virginia Snakeroot

Berrie Oil

Suet

Simaruba

Simaruba

Mustard

Golden Rod

Pink root

Hairhack

Stavesacre

Marsh Rosemary

Queens Root

Stramonium Seed

Storax
 Amber
 X Tobacco
 Tamarinds
 Tansey
 Tapioca
 Dandelion
 Venice Turpentine
 Chain Turpentine
 Tormentil
 Poison Oak
 Zaccarath
 Fever Root
 Elan Bark
 Slippery Elm Bark
 Raisins
 Uva Ursi
 Valerian
 White Hellebore
 Green Hellebore
 Violet
 Winters Bark
 Yellow Root
 Prickly Ash

Ginger
 Milfoil
 Banberry
 Baobab
 Maidenhair
 Horsechestnut
 Torchwood. Spunk
 Amn Agave
 Common Agrimony
 Ground Pine
 Ladies Mantle
 Water Plantain
 X Alkanet
 Hedge Garlic
 Com European Alder
 Ambergris
 Cashew-nut
 Scarlet Pimpernel
 Bugloss
 Sorrel Tree
 Meadow Anemone
 Gum Anime
 X Anatto
 Chervil
 Com Toad flax
 Columbine
 Betel Nut
 Prickly Poppy

Asarabacca
Redhead, Bloodbced
Asparagus
Female Fern
Balsam Gilead
White Indigo
Barbadoe nuts
Bassora Gum
Bellium - Gum
Bean of St Ignatius
Becheru Bark
Bedeguar, fungus Rosarium
Barberry
Wood Betony
Com European Birch
Bistort
Bitter Ash
Borage
X Brazilblood
White Bryony
Cabbage tree Bark
Cahinea
Marygold
X Cam Wood

Canary Reed
Caoutchouc
Caper-bush
Gum Caranna
Cuckoo flower
Catalpa, Cordofolia
N Jersey Tea - Red root
Cedron
Climbing Staff Tree
Blessed Thistle
Celandine
Chicory
Water Hemlock
Com Scumay Grass
Cocoa, Chocolate nuts
Cocconut oil
Barberin Trees
X Coffee
Horseweed, Richweed
Bladder Senna
Sweet fern
Lilly of the Valley
Solomona Reed
Copal
Clove Bark
Peaked Nagel

8
Navel wort, Pennywort

Watermelon Seeds

Culilawan

Amir Dittana

Artichoke

Hounds Tongue

Ladies Slipper

Love Pink

Apple's Animal Oil

Beetle Oil

Leather Wood

X Dragon's Blood

Trailing Arbutus

Coca

Burning Bush, Spindletree.

Eye-bright

Com Europn Ash

Sea wrack- Bladder wrack

Fumitory

X Tuftie

Galanga

Goats Rue

Cleavers, Goose Grass

Ladies Yellow Bedstraw

Yellow Jasmine

Dyers Broom, or weed

Herb Robert

Wildbenna of Europe

X Blue

Cudweed

Hedge Nysop

Guaco

Guano

X Sun Cotton

Bulla Percha

Chaulemoogra

Witch Hazel

Govy

False Sunflower ^{ant} ~~ant~~

Pears foot

False Unicorn Plant

Hernostictis

Asacou

Common Hydrangea. ^{Flask}

Yellow Root, Orange Root

St Johns Wort

Nysacou

Nysop

Hally

Florida Anise Tree

Duck-me-not.

Masterwort.

Indian Yellow

X Indigo

Wood, Pastel

Twine leaf

Mountain Laurel

Ladanum

Lac

Marsh Tea

Leek

Nuttall

Gray feather, Button Snakeroot

Lovage

Common White Lily

Sweet Gum

Gromwell

Honeysuckle

Lycopodium Clavatum, Clubmoss

Loosestrife, Purple Willow herb

Malambo. or Matias bark

Mandrake

Indian Cucumber

Melilot

Menispermum Canadense

Lee Plant

Mesquite Gum

Balsam Apple, Balanina

Monesia

Moxa

Mushrooms

Myrabalans

Artificial Musk

Naffodil

Spikenard

Watercress

Nutmeg flower

Sweet-scented Water Lilly

Basil

Five leaved water Hemlock

Tree Primrose

Oil of Andia

" of Ben

" Cade

" Euphorbia

" Jasmine

X Olibium

Onion

Opopanax

10

Buck drops, Cancer root
King Yellow
Rice
Wood Sorrell
Ox Gall
Peony
Calin Oil
Wall Pellitory
Prune Dock
Paullinia, Guana
Peach Feaver
Pichurin Beans
Small Burnit Saxifrage,
Pinkneya & Pubens, Michaux
Jamaica Dogwood
Plantain
Leadwort
Common Polypody
Hair Cap. Moss. Robins Rye
Poplar
Garden Purslane
Cinquefoil
Lions foot
Self heal Heal all

Lungwort
x Pumice Stone
Acetone
Wild
Yellow flowered Rhododendron
Riga Balsam
Ritthera Incision, Kameala, Reero
Salep
x Sandarach
Sanicle
Sandal Wood
Sarcocolla
Sarracenia, Sidesaddle plant
Sassa gum
Sassy Bark
Summer Savory
Nasturtium
Figwort.
Scilleap
Rye
Small Houseleek
Common Houseleek
" Groundsel
Catchfly, Wild Pink
Nidge Mustard

Copal Experiment

Sparingly Soluble in Chloroform & Oil Marbano
Insoluble in Kerosene

"	"	Benzene
"	"	Kerosene & Ether
"	"	Turpentine
"	"	Alcohol
"	"	Ammonia
"	"	Acetone

Sparingly Soluble in Chloroform & Marbano
Take fine powdered Copal in a dish
Place in boiling water until it softens
Very Soluble in Ether Marbano and Hot Alcohol
It test tube in ~~hot~~ Hot water and let
mess boil slow
or let it stand a long time in sun
only looking solution
Caoutchouc mixes with Soluble Copal
When heated to a very High heat it
becomes Volcanized. but when Heated
mod it gets to a hard substance
and I think would be very good for
our purpose. It would have to be
Heated Hot
Mix in Cobalt Alcohol & a little Camphor
turns it in to a tough substance

Copal Experiment

Copal Soluble in Oil Rosemary.
 " " Ether Ammonia & Hot Alcohol
 Insoluble Crocodile & Ether
 " " Hot Alcohol
 " " Turpentine
 " " Oil Marbame
 " Sulphuric acid
 Sparingly Soluble in Camphor & Ether
 Insoluble oil almonds
 " " Ether
 " " Alcohol
 " " Turpentine
 " " Ammonia
 " " Acetone

Acetone

in Alcohol Vapor

Ether

Copal first melted insoluble in
 Everything now like to try

Ether & Hot Alcohol Sparingly Soluble

Copal in oil rosemary

Guttapercha in oil Turpentine

combines when heated

and makes a tough substance

Copal oil rosemary

Melted Rubber very good

Soluble Copal & Grape Sugar no good

" " Jalapin no good

Copal Experiment -

Alcohol Chloral Hydrate don't treat it
 add a little camphor still no good
 Alcohol Hyposulfite Soda - Camphor no good
 " Acetic acid no good
 " with camphor do
 " " Caffeine do Camphor do
 " " Carbolic acid do
 " " Caustic Potash slightly soluble
 " Naphtha no good
 Alcohol Carbonate " "
 " Nitrate of Ammonia " "
 " Nitrate of Potassium " "
 " Chlorine " "
 " Sulfate Calcium " "
 Alcohol & Ammonia sparingly soluble
 " Camphor " "
 " Cyanide Potassium no good
 " Carbonate Ammonia " "
 " Cobalt Nitrate " "
 " Carbonate Barium " "
 " Sulfate Cadmium " "
 " Hydrate Lime " "

Arsevids of Soda Kill in 6 minutes

Platinum in good

Morphine Muras no good

Selenic Acid native no good

Stychnia in good

Tox by Hydrogen no good

Carbonate of Lead no good

Sulphate Quinine not much good

Sulphate of Quindine no good

Magnesi Bromide in good

Nitrate of Zinc no good

Bellurine Pure no good

Acetate of Silver no good

Manganate of Soda no good

Cinnabar no good

Sodas of Lime no good

Protobloride of Mercury they don't like it ^{very} _{at all}

Carbonate of Barium no good

Excrement in good

Chromate of Lead no good

Nature Natrum formicium no good

Morphine Pure no good

Sulph Cyanide Potass kills in some time

Test Manganese no good

Ammon Citric kills in 11 min

Subsulph of Iron no good

Cupri Cyan no good

Mangan hypophos in good

Molybdate of Soda no good
Acetate Copper crys no good
Jungstale Ammonia no good
Alcamin no good
Parschloride of tin no good
~~Zinc~~ Iron Oxalate in good
Chamaeleon min no good
Phosphate of Soda no good
Ammon citric Kells in five min
Carbonate of ammonia no good
Oxamate of Zinc no good
Antimonate Potash pure no good
Hydrobromate Ammonia not much good
Baktium no good
Microscopic Salt no good
Citrate of Soda no good
Sulphur Carbonate of Soda no good
Jungstale Acid no good
Sulphuric Barium no good
Iron Arseniate in good
Candellin no good
Nitrate of Lime in good
Protide Antimony no good
1) Sulphate Ammonia no good
Oxamate of Soda by again
Phosphate Ammonia Kells in 5 min
Caustic of Barium Kells in 5 min
Nitrate of Silver Kells in 12 min
Santalum no good
Chloride Alumina no good

Alcohol
soluble

Ether oil Marbana Hot A

oil Rosemary

and Ether Ammonia
and Alcohol

Creosote and Ether is good

Hot Alcohol is good

Turpentine is not

oil Marbana is not

Sulphuric is not good

Camphor & Ether a little soluble

oil Almonds cod buter oil is not

Alcohol Vapor is good

first melted insoluble in every

trial

Ether and Hot Alcohol Springer

soluble

insoluble in Acetone

Alcohol soluble in oil Rosemary

Gutta Serena in oil Turpentine

concretes when heated and

makes long substance

Alcohol & oil Rosemary

melted rubber very good

highly soluble in Chloroform
x-Morbid
fine powder of alphas in dist. with
some in boiling water
very soluble in E. M. M. and H. M. M.
I have told him in Hot water and boil
How to let it stand for a long time
the usually looking solution

Drug Experiment

Resonance

Poig. Experiment

Chloride of Tin ~~no good~~ Kill in five minutes
arsenious acid the tithe the floor
Cyanide of Potassium Kill in one minute
Lactic Acid no good
Phosphate of Soda no good
Sulphate of Potash no good
Nitrate Strontia no good
Kali Valerianicum no good
Chesote no good
Nitrate Cobalt no good
Zinc Sulphate no good
Kasline no good.
Nitrate, Potassa no good
Benzal sure death
Acetic Acid ditto

Yellow Pruss Potash makes them sick

Jannin no good

Phospho Lime no good

Urea acid no good

Alum no good

Chlorate of Lithium no good

Gum Arabic no good

Bon Black no good

Bisulphite Soda no good

Red Sulphuret Antimony ~~no good~~

Berberis muric no good

Protoxide Nickel no good

Chloride Potassium no good

Palmitic Acid no good

Hypochlorite of Lime no good

Ferr Ammon citric no good

Chromate of Potassa no good

Cyanide of Silver no good

Valerianate of Soda kills in ^{five} minutes

Quinine Muriate kills in 4 minutes

Sulphuret of Tin no good

Iodide of Antimony kills in 10 minutes

Quinidine no good

Quinine Citrate ~~kills in 3 minutes~~
no good

Sulphate Cobalt kills in 7 minutes

Valerian Ammonia kills in one minute

Bromide of Sodium no good kills in 10 min

Tannic acid no good kills in 10 min

Arseanate of Quinine no good

Valerianate Magnesia kills in 2 min

Quinine Tannate no good

Phosphoric Acid kills in 10 min

Sulphate of Nickel no good

Malbdate Ammoniac kills in 4 min

Sulphate of Lime no good

Acetate of Baryta no good

Bisulphuret of Tin no good

Terbale Potash no good

Borate of Copper no good

Hydrosulphate of Soda no good

Ammon Boracic no good

Sulphate of Morphine no good

Nitrate of Lead no good

Merispermium no good

Ferrocyanide of Soda no good

Camphoric acid no good

Chinin Valerianum no good

Zinc Cyanur no good

Alvin no good

Ammon galles no good

Carbonate of Strontia no good

Carbon of Lime no good

Thymol no good

Sulphate of Soda no good

Sulph. Manganese no good

~~Carbonate of Potash~~

Carbonate of Manganese no good

Citrate Magnesia no good

Nitrate of Magnesia no good

Acetate of Zinc no good

Oxalate Strontia no good

Sulphate of Lime mix

Bromate Potash kills in 6 minutes

Oxalate Potash kills in 6 minutes

Cosine no good

Black Sulphur & Antimony no good

Sodium Permanganate no good

Utrate of Potash no good

Peroxide of Lead no good

Bromide of Potassium no good

Sodium Sulphate no good

Acetate of Lime no good

Magnesia Carbonate no good

Ammonium no good

Lactate of Zinc no good

Bisulphate Potash kills in 8 minutes

Chlorate Soda no good

Croci Antimony no good

Nitrate Magnesia no good

Chlorate Potash no good

Bisulphate of Soda kills in 4 minutes

Sulphomolybdate, K Na or even
+ in pen - / try Maly also P6 pen

Mono chromate Pot. in pen little
free acid,

Sat sol or pen - / Hydrosulphate - soda, in
pen

Acetate P6, little HCl. NO₂ - P pen

" Hypo soda or sulphate K,

Sulphocyanate K, acetate P6 -

is. in K P6 acetate,

Sulphocarbonate Calcium Lead pen

Insoluble ch P6 in Hypo Na.

Proble Lead (Litharge) diss in hot
K ley form yellow fluid, P pen H

Litharge diss in hot lime water P pen H

Bibasis Sulphate arsenate Na P6 pen

Gravel Auger	Carbonate Potash
Silver & Zinc Nit	Iron & Nit
" "	" Zinc on clove 24 gms down
" Copper "	" Copper " " 3
Carbon & Iron "	Platinum & Aluminum Nit
Zinc & Aluminum "	" Zinc "
Copper & Carbon "	Carbon & Platinum "
Platinum "	" Copper "
Iron & Platinum "	Zinc & Aluminum "
Zinc & "	" Iron & Iron "
Copper & "	" Zinc & Tin "
Aluminum "	" Copper & Lead "
" "	" Platinum "
Zinc & Tin "	" Lead & Zinc on clove 1/4 gms down
Iron & Zinc "	" Silver & "
Iron & Iron "	Iron & Platinum "

Bi Sulphate Phosphate on closing
8 deg Lead & Zinc

Silver & Zinc Mix

Copper & Lead "

Carbon & Iron alloy

Phos. Iron

Zinc & Tin "

Aluminum & Zinc Mix

Carbon & Phosphate

Zinc & " on closing day

Phos. Iron

Carbon & Copper on closing

Phos. Iron

Aluminum & Phosphate Will

Copper & Phosphate "

Copper & Zinc 15 on closing

gone down to 9 1/2 without closing

Iron & Zinc Will

" & Iron "

Aluminum "

Hypocrite's Gate of Bonnie Platin & Zinc
Hill

Ischid ~~Zinc~~ with Platin & Zinc
Hill

" Iron & Platin "

Zinc & Aluminum Hill

Upper & Carbon on closing 2 deg

Upper & Platin Hill

Carbon & Platin Hill

Platin & Aluminum "

Lead & Copper "

Upper & Zinc on closing 1 deg ~~2 deg~~

in one minute ^{from 100 to 10}

Iron & Copper Hill

Iron & Carbon "

Zinc & Lead on closing 2 1/2 in 4 minutes down

to 1 deg

Phosphate of Potash Platinum Zinc mix

Platinum & carbon

" X Iron

" Aluminium

Zinc "

Copper & carbon

" Lead

Zinc " on closing the jaws right down

Iron & carbon

Zinc & Zinc

Silver & Zinc

Zinc copper closed at bag jaws right down

Copper & Iron

Iron & Iron

Mix

Mix

"

Iron & Zinc - with grape sugar insoluble X

Silver & Zinc with acetal. styechnum insoluble X

Platinum, & Zinc, Hyposulphate Barium insoluble X

Platina Zinc - Potash Zinc. insoluble in HCl

- Peppain -

Dry Sol. of Ferricyanide Pot

Phosphorus, platina & Zinc X

Largely Potash = Platina & Zinc insoluble in Oxalic X

Phosphate Potash & Aluminum Zinc - also aluminum
platin - & Aluminum both melt

Phosphate Soda - Platina & Tin = also X
Cadm & Tin

Bicarb Soda Nickel & platina & nickel both melt

Bromide Potassium - all the rest melt X

Bromide Chromium X

Platin + Iron = Chloric acid = X

Platin Copper - Carb Magnesia X

Ligand, Harns Nitrol X

Nitric Shonbin

~~Hydrocyanic Soda~~

Bromide Sodium

Asimide Soda 12m. + Silver

Acetate Aluminum - Use aluminum
Etch with various Metals

Hypophosphate Manganese -

Hypophosphati Ammonia

Silv etc

Godda Barum

Alkali Polosh

Chemical Phenomenon

A strong solution of Ferrocyanide of potassium crystallized in a closed space (10) a bottle with a porous piece of paper passing from the liquid to the air by the side of the cork. When crystal cream colored & have the appearance of ~~white~~ cream colored silk

A 1 gram in 100 cc's of phosphoric in several months deposits a greenish powder at the bottom of the bottle & greenish crystallized crystallization takes place on the inside of the bottle & within the liquid

Ly 103

a 5-grain of Venice Turpentine &
1 grain Caustic Potash, with a
strip of paper; 100 cc of O
will deposit beautiful
crystals on a piece of paper
inserted in liquid passing
out through the side of the
Coke & bottle after 2 weeks.
These crystals when rubbed
with finger have a quivering
feeling.

Iodide Sodium — 20 grs
in 100 cc of O, with paper strip
in small weeks strip on
become colored red
red with free iodine & paper
swells several times its own.

Oye

and has deposited crystals
on the slip of paper -

May

Gum Guac 20 grms 100° C. aqua
ammonia after 2 or 3 months &
find solution black & slip of
paper immersed is intensely black
how would this be for a dye

^{100° C. H₂O}
1 gram Sulphate of Iron 2 months or
3 in bottles = all turned yellow
& find when specimen is seen
in bottle it reflects greenish
Colors -

Solution of Sulphate Magnesia
20 grammes apparently dissolves paper after 2 or 3 months

Paper in Stannate of Soda
solution seems to be very tough &
hard

Neat test for zinc in metallic mercury, place a globule of mercury in a flat dish, pour several drops of phospho-wolframic acid upon it; if the smallest quantity of zinc be present the surface of the mercury will be colored blue.

no
3

Laboratory Notes

~~Notes~~

16 Neat test for zinc in metallic mercury. place a globule of mercury in a flat dish, pour several drops of dilute solution of phospho-wolframic acid upon it, if the smallest trace of zinc be present the surface of the mercury will be colored blue.

17 Ashing syrupy solution of Arsenic acid dissolves paper immediately, and in large quantities if slightly heated.

18 A syrupy solution of Acetate of Manganese cause paper to swell up several times its original size, and

19 It is stated in Gmelin & other works that paper is insoluble in the volatile oil. I have found that if strips of bibulus paper be immersed in oil of white Thyme and also in oil of juniper wood and exposed to the light that in two weeks the strips fall to the bottom of the bottle in pieces, and when collected can be

Laboratory note.

If upon a flat plate there is poured a saturated solution of phosphorus about $\frac{1}{8}$ thick & a Bell glass put over this with perhaps a small chance for air to leak in. In several hours the Bisulphide will become evaporated, over the plate should be placed a ^{square} plate gauge



after all Bisulphide has risen up the jar putting a cover will when phos dry slant rings or $\frac{1}{2}$ moons, which are formed by a ring which sticks out splits one going to right & left to left clean round plate giving appearance as if a wheel was revolving.

A strong syrupy solution of Arsenic Acid dissolves paper immediately and in large quantities, if slightly heated -

~~Acetate~~ A syrupy solution of acetate of Manganese causes paper to swell up several times its original size, paper is also soluble therein to a considerable extent. It is stated in Linneus and other works that paper is insoluble in the volatile oils. I have found that if ^{strips of} bibulus paper be immersed in Oil of white Thyme, and also in oil of Juniper wood & exposed to the light that in two weeks, the strips falls to the bottom of the bottles in pieces and when collected can be kneaded in the fingers and has the appearance of a semi-transparent wax. This solvent power ^{of the white thyme} is greater. The other volatile oils have no such effect.

marks:
Potassium (Uben) yields with formate of KO green precip
which dissolves in excess of soda salt.

Aqueous sol of a formate yield dark red precip with
ferrous salt,

Manganideyanide of KO yields brown precip with
Lead salt,

Manganideyanide of KO yields rose red colored
precip with zinc salt,

Potassium ^(Uben) Cyanide KO black precip

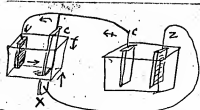
see 466, Vol. I. again.

Mix Linseed oil with Chalk
spread Chalk out to dry
for several days this allows
Linseed oil to oxidize, then dissolve
Chalk in HCl - & see what gets
Exhaust residue with Ether - then
leave white mass suspended in

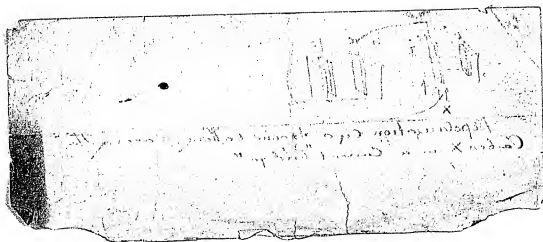
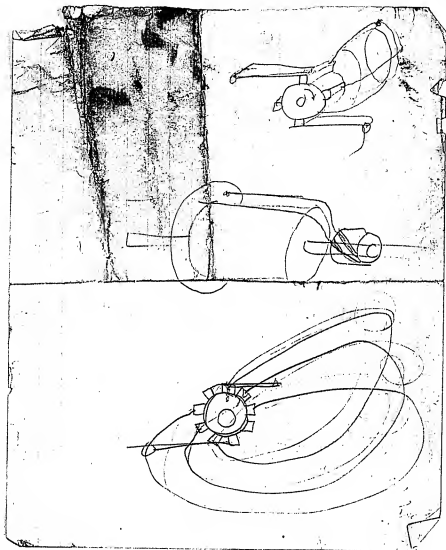
Boil Linseed for long time with
very dilute Nitric acid until its thick &
don't stick to finger

Heat it with $\frac{1}{4}$ lb weight of phosphorus
in a corn can

1 Lin oil 2 Corn Nit a 4 bulk W
heated from tough Elastic Resin



Depolarization by a second battery placing the
Carbon X in a "Current bridge"



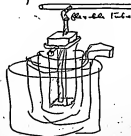
Vol 5.

Page 1

Coat the $1\frac{1}{2}$ Carbon with
white of an Egg very thickly.
then put it in flame of a Bunsen
burner and Carbonize the Albumen.
This will leave finely divided
Carbon on the Coke and tend to
depolarize it from Hydrogen

B.

Place a $1\frac{1}{2}$ Carbon cell in a
porous Cell and pack it with very
finely divided pumice stone.
Then put it in a battery of four
just enough NO_3 to maintain
the top.



Tube through the Carbon which
is connected to a gas pipe by a
flexible tube, air is forced through the
gas pipe and the air passing up from
the bottom of the Carbon takes the
hydrogen with it and depolarizes
the oxygen from the H_2O . Several Bunsen
cells may be connected in this way.

Good

Teroxide Antimony, chl sod. no acid,
platinum pen. to zinc of battery, also
try antimony - Hydrogen reduces
Antimony to metallic state,
Basi. Peroxide of antimony ought to
be best, as $56\text{O}_2 \times 56\text{H}_2\text{O}$.
black powder, very delicate,

and this Antimony not good

Chl Sodium must not be used with arsenic

Arsenate of soda. platinum pen
to zinc of battery,

Copper pen. ~~for~~ grape sugar - only
to zinc red sub ox

Zinc & lead
battery

Copper pen to zinc & coke.
Arsonous acid, -

Platinum Pen, associated with zinc pen
also zinc pen alone, to zinc of battery
Arsonous acid, black mark

○

Flowers sulphur chalk, prolosulphat
nom. platina pen. Zinc of battery.
also Hyposulphite soda. Prolosul Fe
platina pen to zinc of battery.

75 lbs dry Nit ammonia
25 parts dry Hydrochlorate
of ammonia. with 2 or 3 times
bulk sand when nitric
fuses Nitrogen Chlorine
+ H₂O given off =

Undated. Electric Light (NS-Undated-003)

If a small ^{metallic} piece of Silicon be placed between the Carbon points of an Electric light and ~~the~~ a weight be placed on ^{the upper} vertical Carbon. The passage of the current will heat the Silicon & cause the Electric Arc to appear. This continues indefinitely the Silicon serving both as a Conductor to the separator and a means of preserving the continuity of the arc by its conductivity ~~in a metal~~ & by its presence as a separator of the two Carbons. = Brown does not answer so well. I have only tried it with a ~~small light~~ ^{few elements of somewhat high resistance}.

one of.
If the poles of 50 cells of ^{Leclanché} ~~Carbon~~ Batteries is armed with a stout platinum wire, and the other pole connected to a series of disks of different metals. The touch of the platinum to any one of the disks will give the Electric Arc, but if Condensers of 10 microfarads capacity be connected from pole to pole, the Electric Arc cannot be obtained but in its place, the most beautiful scintillation ^{we observe} ~~is observed~~ ^{the scintillation} ~~is observed~~ ^{is observed} only touching the metals ~~is not on disconnection~~ with the platinum point. The scintillation in the case of iron radiates out ~~some~~ from about out like the rays of the sun with inconceivable rapidity and sometimes in the case of iron reach a length of 12 to 20 inches. These scintillations of the different metals are peculiar, not on account of their color but on account of black metal producing

scumellations of a different character.
With iron they ^{quite} ~~are very~~ fine and are thick near
their apparent centre - with aluminium
they are very thick and few ^{in number} of them, and they
shoot out ^{at right angles} ~~at~~ downwards,
Each turn at right angle ~~at~~ downwards,
With lead the scumellations are as fine as the
first specimen - with ~~and~~ and many of them
are not seen until several inches from the
plates - These scumellations have other peculiarities
such as forked ends of various kind, etc.

Paper left for 2 weeks in a 1 gram solution ~~in 100 cc.~~
of Manganate of soda in 100 cc. is completely
decolorized and when dry ~~roughly~~ to
a very fine black powder =

Notes

and experiments to be tried

notes.

Grind on the glass slab with oil. Oxide of Titanium until it is as fine as lamp glass. I propose to mix this with kerosene or petrolin because it will become a conductor when the heat get high & by proper proportion it may itself regulate the temperature because it ~~will~~ tend to reduce the resistance.

Oxide of Zinc Cement = Hard as marble & work same as plaster paris.

Sol ZnCl₂ 1.49 to 1.65 Spec G. dissolves 3 p.c borax or Sal Ammoniac add oxide zinc which has been heated to redness until mass proper consistency, This cement becomes as hard as marble.

Alumina infusible Mitchell manual assay page 122



Try this
platinum cones fastened together
with small platinum wire,
current clock in current
becomes the taper and become
hotter than the large end,
perhaps an incandescent
spiral wire be helped
this way. Try alcohol
lamp on this, using soda

Make a stick of lamp block or Graphite with peroxide
of lead - Chromic acid - peroxide mangan
Lithium etc.

Following minerals infusible in blow pipe
Quartz. Corundum. Spinel Zirconite.
Pleomaste. Andromolite. Garnite. Olivine
Certe. Zircon. Diathene. Cyanite. Leucite
Jade. Gehlenite. Anthophyllite. Sclerolite
Kymophane Gadolinite —

The following phosphoresce or glow heated
Rutile. Titanite. Tantalite. Turquoise
Calcite. Chondrodite. Topaz.

The following are fusible with difficulty
or only on the edges

Adulante. Telartine. Albite. Pelalite
Labradorite. Anorthite. Tabular Spar
Meerschaum. Speckstein. Serpentine.
Epidote. Vide Mitchell page 227.

do
Baryte alone is infusible (C. Canalic Baryte
heated red hot.)

H.P.	Calorimeter per hour	Calorimeter per day	Cost of fuel per ton	Expense per year of 365 days
3600	6000 lbs	36 tons	\$90	\$32.40
1800	3000	18 "	\$45	\$8.10
900	1500	7 1/2 "	\$22.50	\$4.05
450	750	3 3/4 "	\$11.25	\$2.03
225	375	1 7/8 "	\$5.62 1/2	\$1.02
112	187 1/2	9/16 "	\$2.81 1/4	\$1.02
56	93 3/4	9/32 "	\$1.41	\$1.02
28	46 7/8	467/8 "	.71	.51
14	23 1/2	23 1/2 "	.35	.25
7	11 3/4	11 3/4 "	.18	.12
3 1/2	5 3/4	5 3/4 "	.9	.32
1 3/4	2 3/4	2 3/4 "	.45	.16

If one spiral for H.P. Costs \$9 per year then

2 spirals costs \$18 per year

3 " " " \$27 " "

4 " " " \$36 " "

5 " " " \$45 " "

6 " " " \$54 " "

7 " " " \$63 " "

8 " " " \$72 " "

9 " " " \$81 " "

10 " " " \$90 " "

11 " " " \$99 " "

12 " " " \$108 " "

13 " " " \$117 " "

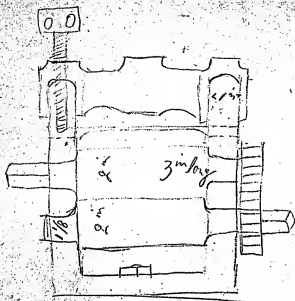
14 " " " \$126 " "

Expenses based on average value
of Spirals given in a test party
under.

H.P. Horsepower	Cost (estimated) per hour	Revolutions per minute	Expense per day (est. of 8 hr)	Expense per year (est. of 300 days)
3600	6000 lbs	30 Tons	\$90.	\$27,350
1800	3000 "	15 "	\$45	\$13,425
900	1500 "	7 1/2 "	\$22.50	\$6,712 1/2
450	750 "	3 3/4 "	\$11.25	4107
225	375 "	3750 lbs	5.62 1/2	2,053 1/2
112	187 1/2	1875 "	2.81 1/4	1026 1/2
56	93 3/4	937 1/2 "	\$1.41	513 1/2
28	46 3/4	467 3/4 "	.71	256 3/4
14	23 3/4	233 "	.35 1/2	128
7	11 3/4	116 "	.18	64
3 1/2	5 3/4	58 "	.9	32
1 3/4	2 3/4	29 "	.4 1/2	16

1/2 one spiral per H.P. costs \$9 per year then

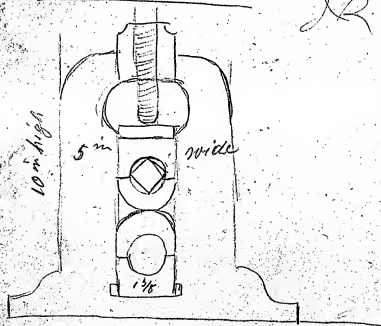
Spiral	Per year
1	\$9.00
2	4.50
3	3.00
4	2.25
5	1.80
6	1.50
7	1.25 1/2
8	1.12 1/2
9	1.00
10	.90
11	.82
12	.75
13	.67 1/2
14	.64 1/2

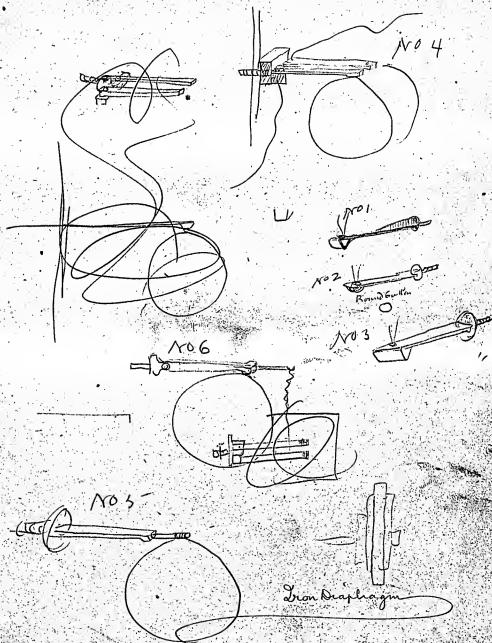


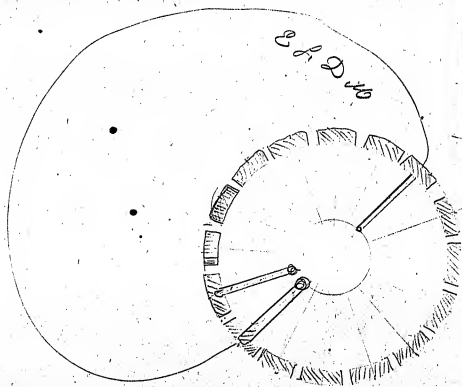
for Kargi

7.7

EL
R



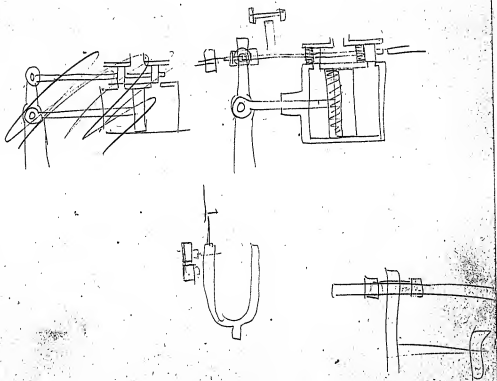


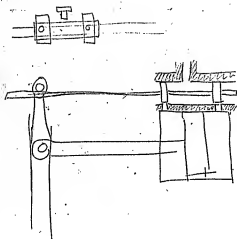


6-	23 ✓
6.	26 ✓
6.	30 ✓
6	36 ✓
12-	30 ✓

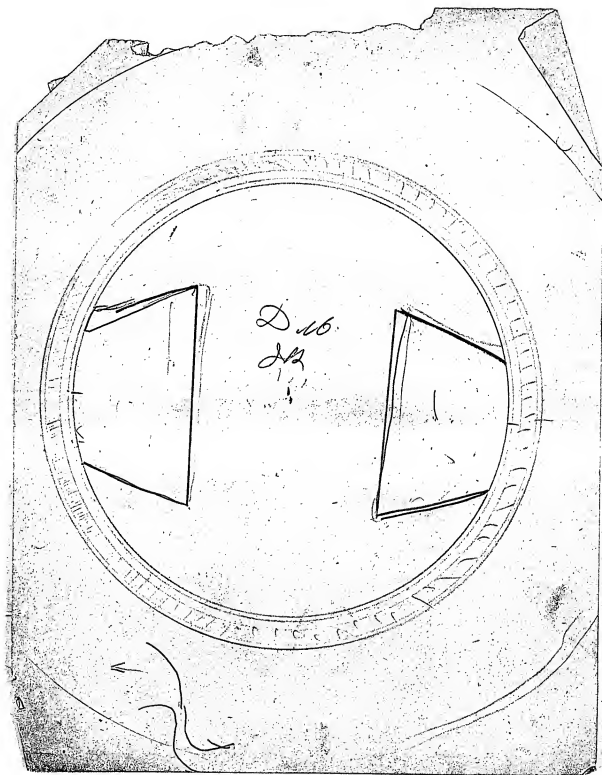


Herm. L. 66
J. H.

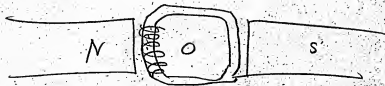
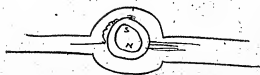
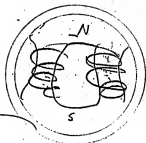




Dell
82

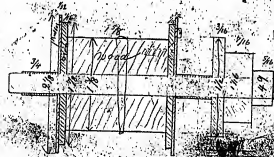
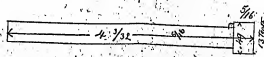
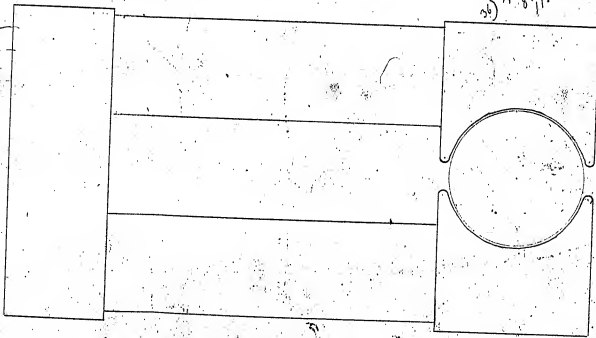


Edgley



Dean Lee Myers about
Mrs. Patterson

D.L.M.

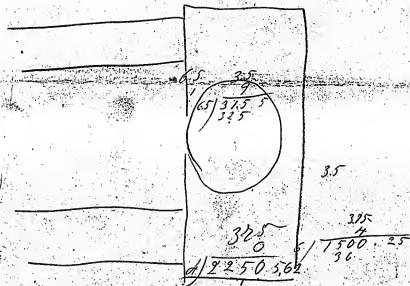


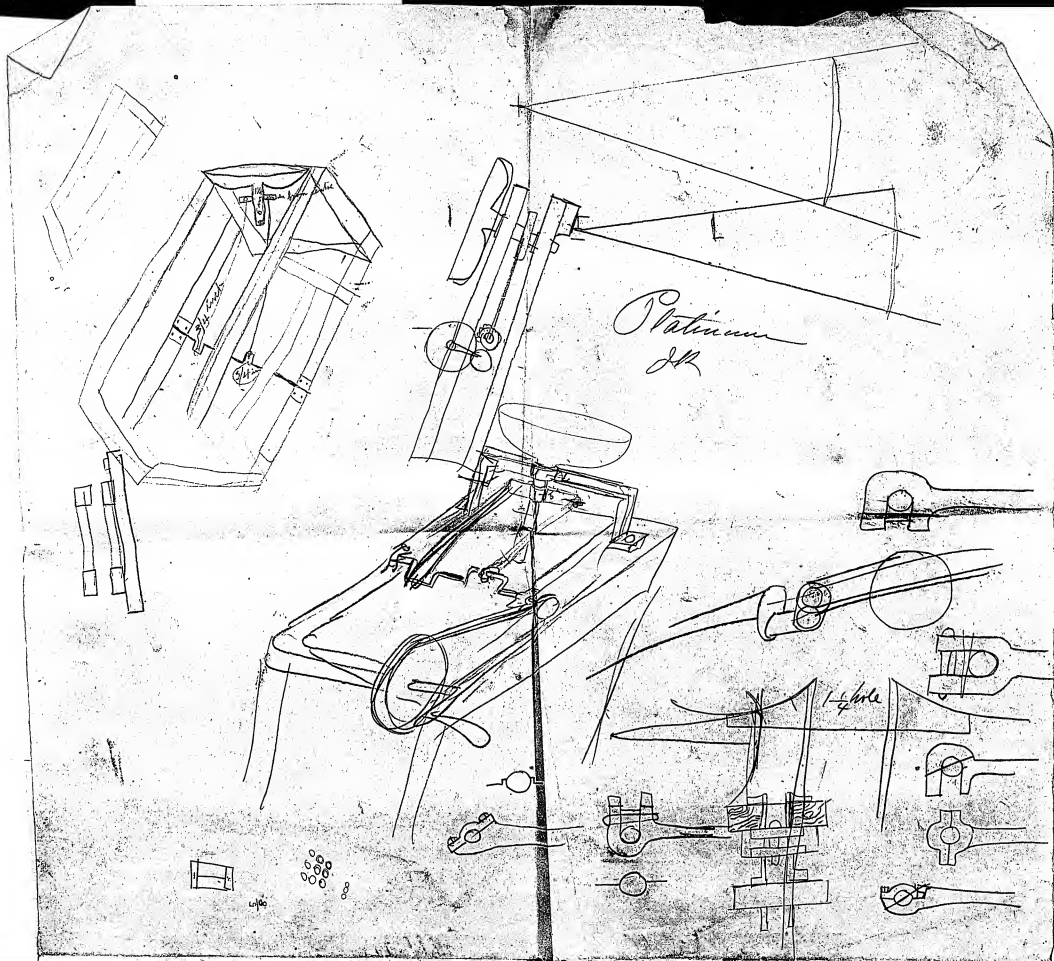
$\frac{32}{16}$
 $\frac{16}{16}$

$\frac{184}{314}$
 $\frac{748}{184}$
 $\frac{561}{584}$
 $\frac{144}{84}$
 $\frac{36}{111}$
 $\frac{90}{115.744}$

$\frac{14}{6}$
 $\frac{7}{6}$

3 2 x 3 pine 16 ft long
 60 ft of matched 1/2 in 6 in wide
 16 ft long.
 2 lbs of n.p. nails





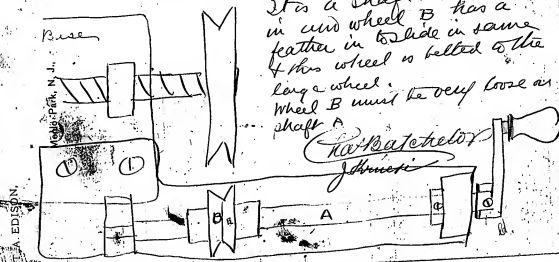
Undated. Phonograph (NS-Undated-004)

Tracings follow other notes and drawings.

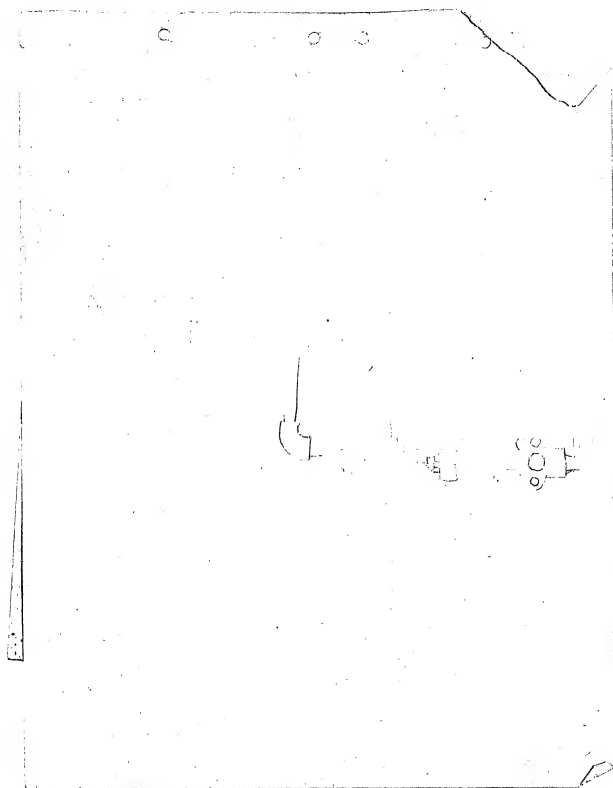
Use a data bracket on Monotype
like this to turn the cylinder slow and
turn the needle fast.

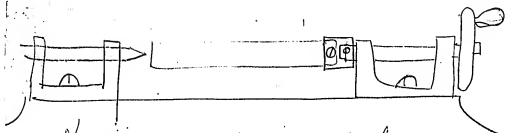
It is a shaft A with slot
in end wheel B has a
feather in to slide in same
& this wheel is belted to the
large wheel.
Wheel B must be very loose on
shaft A

Chas. Batchelor
Johnston



W. A. EDISON





Make the carrier for the mandrel
like sketch with set screw to hold it
at one end & centre at other

Batcheln

2607
14 1/2

14 1/2

15/11/20

5/2/74

1.40

12/5/10

2.

These weights of 2×1
weight of $1 \frac{1}{2} \times 1$

Weight of $1\frac{1}{2} \times 1$

5/5/2012

۱-۲-۳

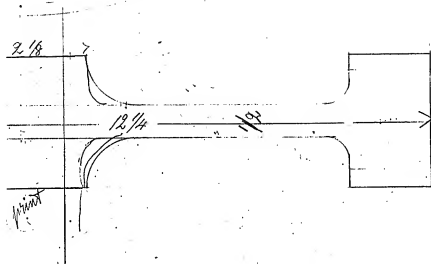
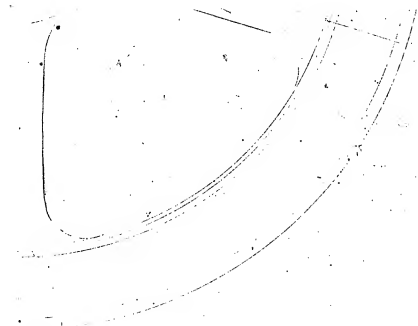
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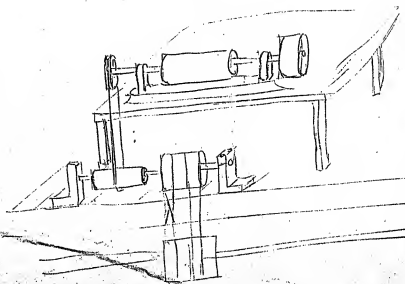
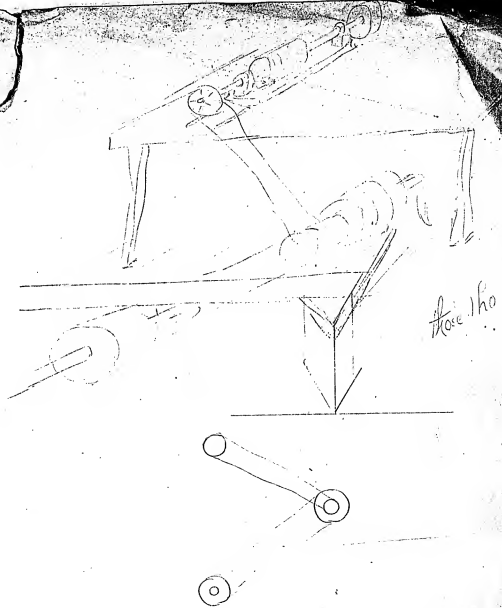
$$\begin{array}{r} 3464 \\ 15326 \\ \hline 45216 \\ 30726 \\ \hline 95936 \end{array}$$

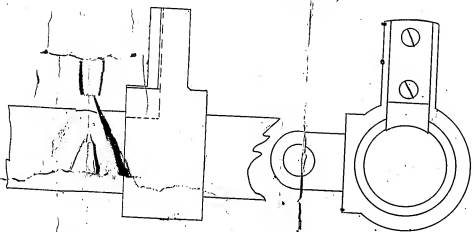
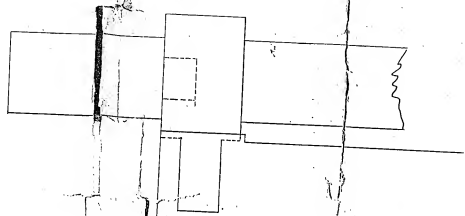
3/25

0/0

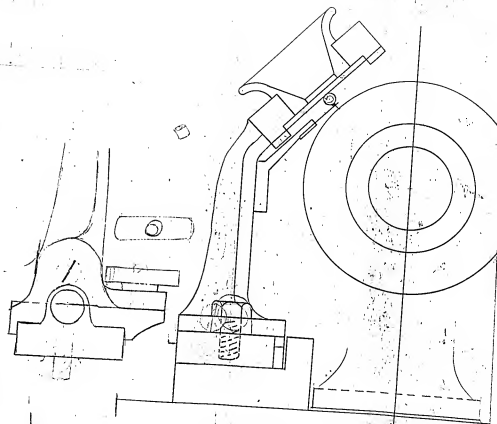
1







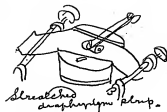
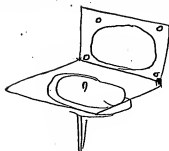
[CONTINUED ON THE NEXT FRAME]



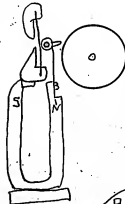
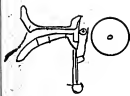
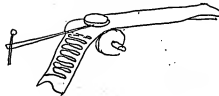
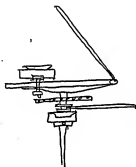
[CONTINUED FROM THE PRECEDING FRAME]

New bond Phonograph

non foil



stretched
anaphylaxis pump.



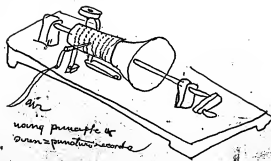
ind foil,

Reproduction and
Contact

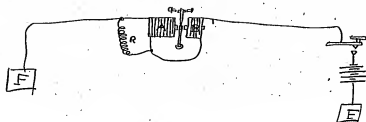
also by magnetic induction



TRACINGS



Undated. Telegraph (NS-Undated-005)

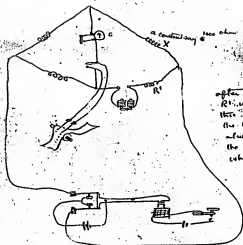


*Reversals will
only be stronger*

A and B are both in the same circuit
when R is on A. Both pull the armature
in opposite direction with equal strength.
Supposing the line closed in the line to the
right at the moment of opening B will
lose its magnetism immediately, whereas the current from
A circulating within the shunt will cause its
core to retain their magnetism for some an instant
the magnetism draws the line to A, where it
remains if the current is closed B instantly
obtains its magnetism while the self-induced current
from A circulating within the shunt retards it
magnetizing, thus hence the line is attracted by B.
A & B may be the same length, but greater magnetism
obtained when B is shorter than A.

In using the iron recording points smooth the ends every few minutes
with a smooth Swiss file otherwise they will scratch the paper - the
oxidation causes the points to become rough - also try to
get both the points to have the same pressure - if the pressure
is unequal one current will appear stronger than the
other - The filing will also keep the points even
with each other - do not use the paper when too
much as the record will not be sharp - The straighter
you can get the pen, the better

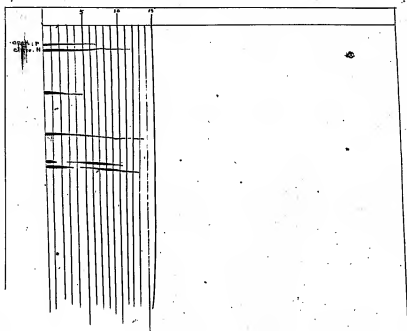
To get a magnet always in a circuit after some vibration starts send magnet.



after the insertion of the magnet
R1 is to be adjusted so that
the branch containing the magnet
always the same independent of
the position of the magnet
when that is before the resistance of X.

The discharge & charge currents from electromagnet are much greater with
reversed current than with straight currents and in testing it
is best to use the reversed current.

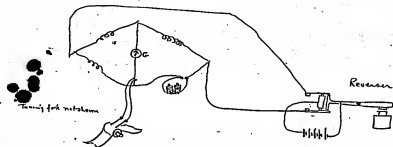
The tuning fork may be adjusted to any rate, perhaps 100 per second
would be the best; with a high rate of vibration the dots may be rather
close together if you desire to record the induction from the magnet
slowly, then you may include in the same circuit with the 100 fork
a 50 fork and allow the 100 to break for it, placing the carbon
for the chemical paper on the 50 fork & ~~the~~ A Wheatstone
clockwork should be arranged to feed the chemical
paper on the strips are more convenient for comparison
although it may be run irregularly at any speed on
the tuning fork dots is the measuring rule.



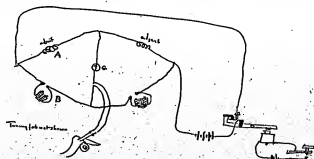
The column might be the tuning for dots, and if you use code of practice paper it will be necessary to immediately record in table the similar to this.

At the same time the swing of the galvanometer needle may be taken providing the chemical paper is plugged out of the bridge. This might serve to correct the chemical test but I don't believe it asserts much.

If it is desired to use reversed current which will put the self induction more strongly
Connect them

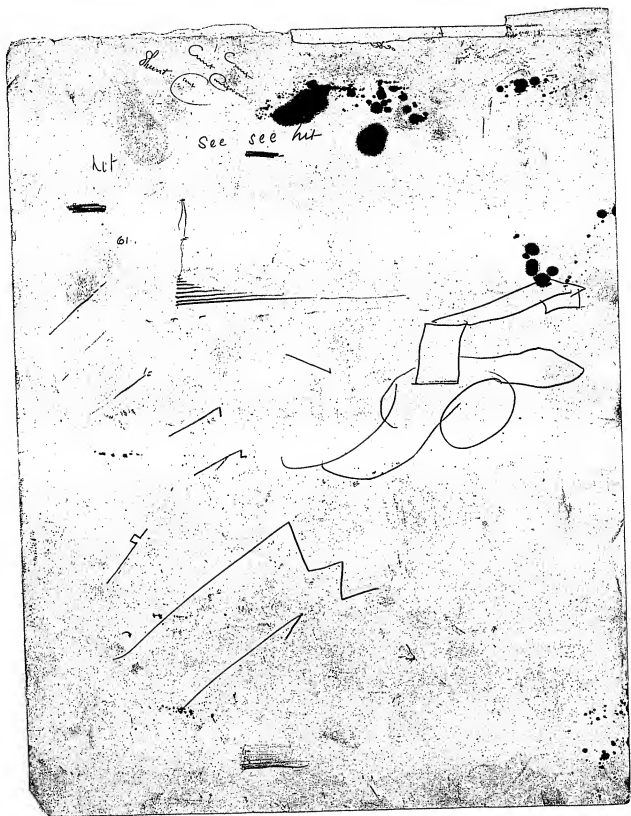


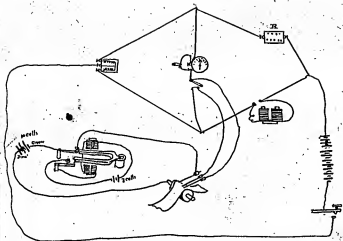
To obtain the difference in the induction of two magnet coils either by balancing one
against the other. Connect them



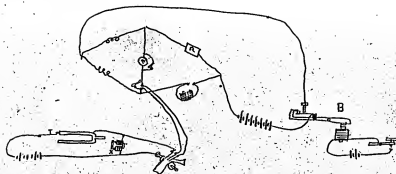
To double discharge or rather increase it

Place B at A + A at B





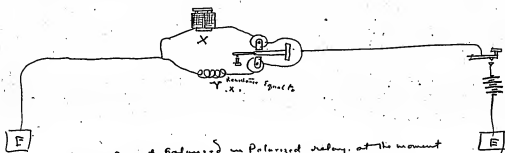
Connections for testing self induction
of magnets



X is a 10 to 20 ohm
magnet with core as
an iron core
and induction to be strong
to clear which of things
about by self induction

B is used as a to get a regular stroke
and because it has a spring contact
which prevents a source of error due
to rebound of key from when
striking a rapid pump.

In place of the magnet polarization battery (secondary battery) may be inserted. Even the polarization of battery may be tested if a Leclanche battery is inserted in place of the magnet and a Daniel or Calland inserted in the other side and sufficient number of elements used they can be balanced, reversals of the outside battery will give the polarization the same as induction, & methods of working by the self induction of magnet.

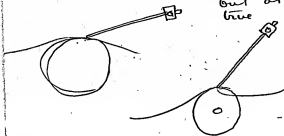


main current balanced in Polarized relay, at the moment of opening & closing the inductive circuit from X there is a current with the current formed by X Y & the relay throws the tongue over.



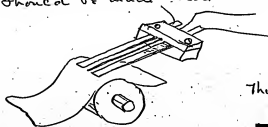
if at this angle the record will not be a true one

but at this angle it will be nearly true



if you want to use a tuning fork with more than 100 vibrations per second the central point should be a little finer & set as near perpendicular as it will work & do not cause too much pressure to be put on it.

If you wish to ascertain by coloration the relative strength as well as discharging & recharge times the recording point should be made wide thus



This will record thus:



If it is desired to obtain a recording point which will record either the closing or the opening change tip and iron wire with tellurium and file off the bottom so as to expose ~~the~~ the iron ~~area~~ the passage of a copper current

when the ferricyanide Paper is used will oxidize the
 iron point form protoxide of iron & this will combine
 with the Ferricyanide of Potassium to form
 Turnbull's Blue if a Zinc Current passes down
 the point Hydrogen is evolved and the combining
 with the Tellurium forms Hydrotelluric Acid or
 Tellurized Hydrogen which is instantly decomposed
 on contact with the air leaving a Brown mark =
thus we have a ^{simple} point which records independent of
the direction of the current =

Another method is this but double points are used



of a to line now record
 of Z to line Tellurium "



X 1
11 minute

~~try it now~~

OK If as near as I can make out
the main battery is taken off
too quick main battery roller
should be exactly square with
the line through the secondary
wire of coil & the local
roll

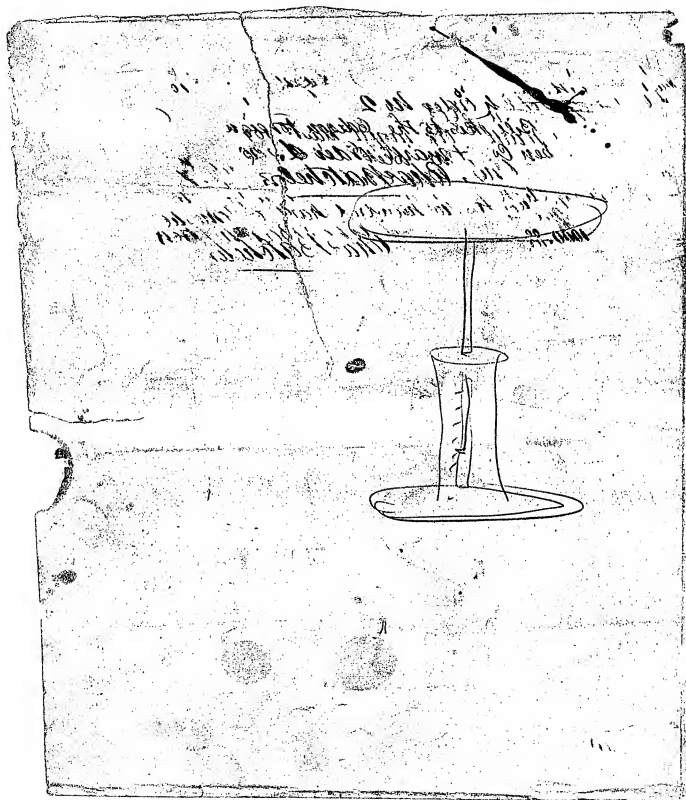
OK If say the main battery roller
should be exactly even with
secondary roller -

OK Yes, main battery & secondary
are exactly on line & the
local about $\frac{2}{3}$ its diameter

OK I understand wait a min

OK try it now

OK minute



X.3,

W ready for faster;

W yes, how fast,

W about 700,

W now -

ga

32705
10105
22600

W its beautiful dakers & the
boys are in E. L. A.

W ~~Yes~~ Na Na

I shall give it to you for

W yes like level

W now ga

Rev

W min

W It is splend. but didn't turn it fast enough

W if you have no speed make a note

it & send slip. W go at same speed

min

W now ga

Rev

Rev

X 4

min sample

That's real good

W Supper u give me abt 500 rods min

W That was at rate of 1/2 mile 4000 a min
big country rods &
very good Clean cut darker says its best

OK want me 5.0 faster

W yes & give 500 rods a min
my u on ready

over draw

W-Darker says its the best its we have
taken yet

send it to me marked by mail

now go

now

Bern

were it shouldnt

thats 500 rods a min

my wh do want

fast a min 1000, I'll turn very

W now go

Bern

my I know that

my I know that

W I know mtr off

want it done

got the feed of it then ^{x 5} were opened X 5
[my] got badly from you got the do
we want it again
yes as soon as paper ready.
~~was~~
~~very soon~~

at this point we
stopped foating with
them - at no time
did they go higher
than 330 - a or so per
minute which they
called 1000. They used
silver pens, and changed
the numbering pen very
often, ~~the~~
~~then fast boat with~~
New Bern

ny I got em

925 PM

Went in I'll try it & see if you
do " get em. to

Now Brrrrrr

now here's something, faster
Wash into Brrrrrr

ny min

Sample 1, 105 wds/min

very well, ya

W. J.

Now

ny ga Brrrrrrrr

Sample 2, 150 wds per min
ny min

ny I was not as good as before

Try again same speed

Wash now?

ny ga Brrrrrrrr

Wash now that's what matters

ny I think what I want to know
is whether this time

Brrrrrr

ny min

Sample 3, 75 wds per min

my min Paper

Wash R n ready

my Try it abt 1000 wds min
w now

Barrrr

my min

" Badly tailed.

938 Pm Sample 4 - 150 wds

my Try it with the

It wont cm bet

a roller first

Ready to

W Sa won

my It now

Barrrr

my min

Sample 5. (155 wds min)

my Thats great deal better min

I will fix my pen a little I think
it will help it. w yes you ought to ^{fix} it
~~partly~~ ~~min~~. How fast was it

W It was fast as hell

~~7 min for 1000 wds~~

W you ready
W sa wn New
pretty fast ~~gotta~~ ~~was~~ min
now ga 800 was min
now

Brrrrrr

Sample 6 (105-wds min)

That. Came beautiful. My pen
wkd better

~~my~~ withking Popoff one Roll
want some more
ds. y. ^{want} some more
got Picture man here
ga 6 to 800
sa wn

now Brrrrrr

Sample 7 (155 min)

My Tit Came elegantly

My now want u send for it

W now faster sa wn

W The local is very poor
I think the great trouble
is it. I don't get any chance
hardly. do u want it removed
to nite it will take 15 min

my yes but not now ga
1000 wds min ga wn

Brrrrrr

Sample 8

How it
tasted somewhat
am thinking the local & ^{very} if it don't Cook
it close not connect up
am doing it now don't of this
we leave off we better buy
a bit more
+ Min

~~He will Min~~

361
50
2

how long did you see Ray
today, only few minutes,
He came in to make app^t for
tomorrow at 830 a clock am
and he would like see auto
work told him a had
try it tomorrow night & he
could see it. He returns
tomorrow night he
says we will have Quaker
was in to proceedings
today, a says it was
there, no.
Yes he went on for a
purpose.

OK gn I will telegraph you
tomorrow whether they tomorrow
please send me some Chase fast
speakers. Yes I will
write tomorrow & send pls let me
know in am what time you by

If you do I shall have
machine fixed here in
morning just thing, you
mean that case. ~~Insulation~~
yes, do very strong -

The insulation
imperfect I see

quite
Hard to put in long P & G over
that is what
I shall,

where you think trouble
is at bending part

Yes & also in the middle
standing which holds drums -

4

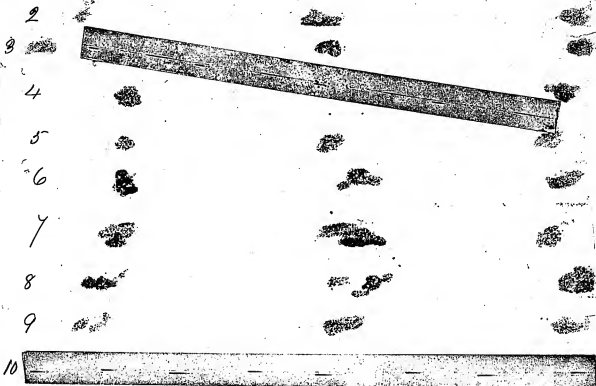
Let you know as soon as P & G
get inst fixed I dont want
to contind with in trial

I think whr thing it will be
well to say the
use any such
as these I will
sketch comon

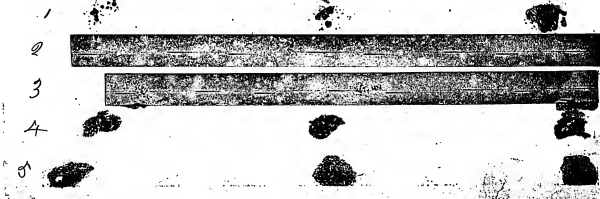
feel please

Yes but little dis appomment
that this shouldnt work
faster we know it has
done such very fast work
that it seems funny it
be so stiff tonight. I
to owing to this short
I think more of it is due to
the very bad escape in the
wire which is indeed cannot
off you have no Gally there &
donat nature it its very hard
to adjust for you leak so bad

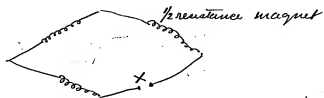
and by moving the cores a little further away each time we got the following in succession —



We now shunted the 150 Ohm relay with a condenser of 3.2 microFarads capacity & took the following:—



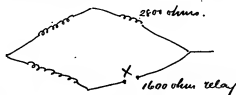
With the 1600 Ohm relay at X and $\frac{1}{2}$ resistance in opposite side thus



and the cores touching & with condenser ^{3.2 MF} round magnet we get this :-

and without condenser this






We now put double the number of ohms opposite the magnet thus



& got this without condenser.

With Condenser round magnet we got this :-

With a 1600 ohm relay^x we got the following:—

- 1 
- 2 
- 3 
- 4 
- 5 

After shunting this 1600 ohm Relay with a condenser we got the following:—

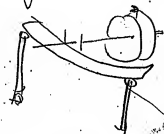
- 1 
- 2 
- 3 
- 4 
- 5 
- 6 
- 7 

Balance

See if you can put a
Change from plate of zinc ^{into}
into a steel needle magnetized
to point north and see if
the Change will make it
point from due north also
see how near a ~~substance~~
a substance insulated or not
will approach before
throwing it out of its
track. ↓

See if by any arrangement
you can prevent the
needle of the galvanometer
galvanometer from vibrating

to the point



may be wetting the silk fibre
which needle suspended on
will do it =

chromic & permanganic acid
part with their oxygen will
smallest current. ~~Here~~ it is a
great object with densin paper
to get the weakest current to
liberate the most oxygen
so as to produce the most

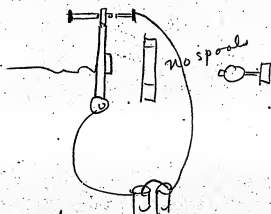
3.
peroxide. Therefore, try Chromic
& permanganic acid with Lanthanum
salt or with other substances
if it should spontaneously
decompose without current
a little, but greater with electric
current would be a light continuous
mark between dots & dashes
But if you run fast 300 words
per min with perf paper the
spontaneously made proto would
not show try it

See if you can arrange a writing
pad to ink the Embossed marks
on Morse Register

Chambers
etc

4
 Try Conductivity of mercury
 & zinc amalgam in small
 hole tube. See if it is high
 & constant

Try this



No magnetism if the mere passage
 of the current through 2 or 3 good
 cells or more of Carbon battery

through the ⁵⁻ammature lever
& platinum points will make
them stick. I suspect
that when the spring
is adjusted so as to just
pull the lever away from
point, when no current is
on by pushing it up with
finger it won't stick but
is battery connected if
jerked up it will stick
owing to magnetic effect
of current on platinum points
include a powder in
the circuit.

Balchulov

6

You know that when Sulphuret
of potash is used with an
iron pen - that the pen become
polarised thus

sent

Received from

on closing the circuit there is an
intense black mark on opening
it ceases on closing again the
mark does not continue for
some time to get rid of this
try a double pen non-polarising
this



also try Copper Zinc pen with
the non

Batch - 7

Put of 10 good Carbon +
test each one on No 4 of Bradley
to get deflection. pick out best
one & try & get 9 other that
equal it = then connect
these 10 to a single cup
giving the same deflection
- connecting the cake of
the 10 cup battery to the
Coke of the 1 Cup battery
+ the zinc of the 10 cup
battery to the zinc of the
1 Cup battery then
take the deflection on 123 & 4

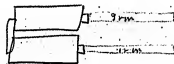
8
of the 10 separate & the 1
separate every few hours
for 3 days. Keeping them
on closed circuit all the
time, also takes the deflection
all together = I want to
see what a team will take
place in the single cell -

Also ~~important~~ if connect
5 good with 5 good opposing
Each other (ie) the Coke of one
5- with the Coke of the other
5- - closed circuit - take
deflection on each 5 separate
~~then~~ then connect

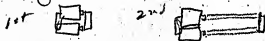
together & take deflection. if
there is any current see which
battery gives it then change
cups so as to get a balance
with 1 or 2 degrees on No. 4.

Put 3 good cups all
same deflection on No. 4.
~~low~~ on closed circuit all
separately take deflection
on all Cents every few hours
wish to know how long a
Carbon battery will last
on short circuit.

10
magnet thru in bridge



testing for induction - see if the
extension of the Cores by putting
two extra wire Core pressing up
against those of magnet will
increase the induction effect
without adding more wire.
also Try this



You can gear up those

wheel so ¹⁶ that you will have
to go quite fast on turning to
get a moderate speed on recovery
you can get Tom to turn &
thatsly get an even speed
in changing from one experiment
to another with the same
magnet it would be best to
keep Tom turning all the time
to keep speed even on other
thing the pressure of your
pen should always be the
same probably the would
answer



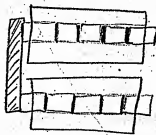
also a whole 1 2 inch of paper should
be wet at once so the paper should
have the same thickness
take the deflection of battery
used on No. 4 Coil & always
keep it up to that deflection
be sure to get bridge
resistance correct so not
the faintest shadow of
current shows on the paper
even in turning slow, it
takes a given amount of
Resistance to ~~have~~ show current
on the next pen after you
cant see it on first $\frac{1}{2}$
this

Try Sald Cores. This ¹³



pull out sald Cores insert core of
fine iron wire sald - with regular
back & armature see which
gives most induction sald or
cores -

Batch Try this for induction &
strength of attraction



core sawed in length of $\frac{1}{4}$ inch
separated by brass & brass
screw or by Beading wax. so each
core don't touch but is with a gap

See as $\frac{1}{100}$ - Have an idea that
there will be no induction & the
attractive strength $\frac{1}{2}$ as great
as solid core thrust in same
bobbin with same battery

138

15
if this is so we can make
long ordinary magnet thereby
getting strength & yet have
no induction.

See
1871. Telegraph
automatic
pages first 14
pages of this
experiment.

Photocopy. Original is in Scrapbook, Cat. 298, Notebook Series.

138 (1)

Every 15 or 20 words which is necessary when the machines do not run in any degree synchronously. It also allows me to prevent the formation of false marks altogether and dispensing with the correcting apparatus. I effect this object by means of a large extra hole in the perforated strip at the transmitting station which hole is in line with a contact roller connected to a very powerful battery with its positive pole to the line.

The current transmitted from this extra hole which is placed at every 15 or 20 words at the pleasure of the perforating operator is to actuate a polarized relay at the receiving station which serves to release two circuit directing wheels N and M which are arranged in such a manner with the recording points A and B and A' and B' that while A and B are recording the top part of a letter A' and B' are disconnected from the line and Earth and prevented from recording a false signal. And while A' and B' are connected to form the other part of the letter the pens A and B are disconnected and also prevented from forming false signals.

In Figure 7 is shown a method for transmitting positive and negative waves in a manner similar to that shown in figure 1. except that

the strip in this case is embossed or indented as it were and in line with two levers A and B held down upon the paper by the springs C and D and both connected to the earth. Springs f and e are connected to the line, f through the battery MB having copper to the line and e through the battery MB having zinc to the line.

Immediately on indentation passes under the tip part of the lever it falls therein and allows the platinum tipped point to come in contact with f or e as the case may be and transmit a positive or negative current over the wire.

These indentations could be dispensed with and the ordinary perforated slip used to give motion to these levers, a slight groove being placed in the drum to allow the levers to fall a greater distance or the drum might be made stationary and two deep holes drilled in it immediately underneath the points near the ends of the levers, the paper being drawn forward by another drum or the embossed paper might give motion to these levers by raising them up but of course the springs e and f would in this case be placed above instead of below as is shown in figure 7.

The instrument works upon one
with ~~not from a~~

It performs ~~these~~ four operations
to wit: - rotation of the type wheel
representing the letter feeding the
paper and correcting the type
wheel.

These various operations are performed
by power derived from two
Electromagnets, one placed in
the main line, rotates the type
wheel and moves the Corrector
it is called the type wheel Magnet
the other is placed in a local
circuit, controlled by a vibrating
circuit closing ~~power~~ spring
from the lever of the type wheel
magnet, this magnet impresses
the letter, feeds the paper
and releases the Corrector.

The transmitting or devices
of the instrument consist of
an electric engine driven by
a local battery, the power of

which rotates the circuit breaker wheel and stop arm devices of the Key Board -

The Engine has two permanent magnets over the poles of which is a revolving armature the electrical pulsation necessary to give it a continuous rotation by taking from a Contact spring operated by the engine shaft.

The Speed of the Engine is regulated by a Governor which in rising comes in Contact with an arm and cutting off all battery power

from the ~~engine~~ ^{from magnets} ~~turns the engine from~~ ^{increasing its speed}

The main break or circuit break device is a wheel the teeth of

which give make a revolving motion to the arm having

two platinum points which close upon two springs having

(1)

This instrument works upon one wire, It performs four operations to wit:- Rotation of the type wheel, imprinting the letter, feeding of the paper, and the correction of the type wheel.

These various operations are performed by power derived from two electro-magnets. One placed in the main line rotates the type wheel and moves the corrector or Unison, and is called the type wheel magnet.

The other magnet is placed within a local circuit and is controlled by a contact point upon the type wheel mechanism. This magnet imprints the letter, feeds the paper, and releases the corrector and is called the printing magnet.

The transmitting devices of the instrument are rotated by ~~consists of~~ an electric Engine driven by a local battery, it being used in place of a clockwork etc. owing to its comparative simplicity and the facility with which it may be regulated.

The Engine consists of two electro-magnets over the poles of which is a revolving armature. Secured to a long shaft, a vibrating contact point operated by the rotation of the shaft is so arranged that a current from a local battery is alternately thrown through one pole of magnet to the other producing a constant rotation of the shaft as long as the battery is of sufficient strength. The speed of the Engine is regulated by a governor which as the speed increases rises to a contact point which may be set at any required position when this contact takes place the battery is short circuited i.e. the battery power is cut off from the magnets consequently the speed cannot be increased beyond this point, this contact piece being adjustable it is obvious that the speeds of all the instruments upon a line can be made the same, an essential point as will be presently shown.

The device which intermits the main line pulsations to rotate the type wheel is connected to the Engine beneath the base of the instrument the connection being made by gear wheels, - The "intermitter" or Main break as it is generally called, consists of a wheel, having fifteen teeth half of the number of characters as there are upon the type wheel. Upon the edge of this wheel is a pivoted lever having upon the end which rests upon the toothed wheel a steel tooth and upon the other end two plating contact points impinging against two other plating points secured separately to springs. When the toothed wheel is rotated the teeth upon its edge give a vibratory motion to the lever bring the two ~~con~~ plating points upon its end in contact with those upon the springs as every tooth passes along thus closing

and opening the main circuit fifteen times to every revolution of the ~~type wheel~~, toothed wheel. One of the contact points is set a ~~at~~ short distance ahead of the other so as to take the spark entirely off from the other point ~~so as to~~ ^{and to} prevent its fusion and thereby ensuring perfect contact.

The stoppage of the pulsations after the required number is sent to bring the type wheel to the desired letter is effected by the depression of the key which represents that letter. The keys have a long arm projecting to and working into a circular ring in the center of the base of the instrument. In the center of which is a shaft carrying two gear wheels one secured permanently to the shaft and kept constantly in motion by the engine during the transmission of a message and the other gear wheel being loose which

draws the main break wheel being loaded upon the shaft by a ratchet wheel and pawl of arm. So that by the depression of a key its arm is lowered into the path of this detent or arm which coming in contact with it lifts it out of the ratchet wheel and the main break wheel is stopped and entirely detached from the other wheels which continue to revolve. If the key is raised a spring pulls the detent inward to the ratchet which locks them together and the break wheel is again rotated. A slight friction obtained by a spring connecting one with the other is used for the prevention of a rebound which takes place when the breaking wheels are suddenly detached from the engine wheels.

The Engine is supplied with a starter which consists of a rod extending through the base of the instrument having on one end a knob and

upon the other a flat spring in the path of a ratchet wheel upon the Engine shaft, so that if the engine fails to start when the battery is turned on as it sometimes does, the rod is pushed inward the spring upon the end of which engages in the ratchet wheel and gives a motion to the shaft.

The battery is switched on by a rod extending through the base at the right hand of the row of keys upon the top of which is a large hand button ^{with a point} and underneath an insulated collar and contact springs, so that by turning the pointer from you the current is switched into the Engine. And by turning it towards you it is cut off and

This switch performs another operation which is that when the message has been sent the turning of the pointer towards you closes the main line and prevents it being opened by the

break wheel which does not always stop in the proper position to close it.

The corrector consists of an arm called the unison arm extending from the the top shaft of the instrument to a deep threaded screw called the unison worm upon the type wheel shaft upon the end of which runs in the screw.

The number of threads on the screw are such that when the type wheel is allowed to make three complete revolutions without printing of a letter the action of the screw brings the unison arm up to a stop pin on the type wheel shaft which is blocked at the zero point upon the type wheel. (The dot next to the letter A) and cannot be rotated farther until the key representing the zero dot is depressed which allows the printing lever to rise.

8
and in doing so the union arm is
thrown away out of the path of the
blocking pin to its original position
at the other end of the ~~union~~ arm and the
type wheel is free to rotate. While a
message is being printed the union
arm is ~~also~~ kept away from the
blocking pin by the constant raising
of the printing lever in printing the
letters of the message. The type wheel
is allowed to run in unison before
each communication so as to ensure
their correct position ~~of the type wheels~~.

18th extra memo
 with the Constant R. & NaCl paper
 we can in plain line without shunt
 at 1200 a minute, with high ~~resistance~~
~~shunt~~ ~~resistance~~ recorded on
 second circuit thus,

~~with high resistance~~
 with high resistance shunt, this
 at slow speed
 with still lower resistance shunt
 with less
 with 200 ohm shunt
 with ~~less~~ nothing shunt
~~gives~~ ~~discharge~~ being
 lost & lost gone

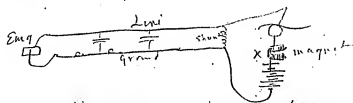
This shows that the
 current through high resistance charge
 exactly like a condenser
 what appears to be so strange
 is that so small a surface as
 a plate a point should send
 so ~~large~~ ~~fast~~ a discharge
 value not equal to the current
 which passes over 1500 ohms
 from 25 cells of battery
 The problem thus resolves itself

2 = 18th Extra Mem

into some paper in which there shall be
a chemical that will not undergo
any back change and yet
be sufficiently delicate to allow
the lever to move at high speeds

So I might try the experiment
of breaking the circuit very
rapidly with a revolving
break wheel with half a closure &
1/2 opening and it did not
give very good results in fact
not any better than tried having
9/10 closure & 1/10 opening and
little increased slow & fast
to 1/10 =

tried a shunt and connected
a magnet of 200 ohms Tell about
position in this



The object of inserting the magnet
in the circuit between the battery

3: 18th Extra new

The instrument was to weaken the 1st part
of every signal sent leaving the last
part full strength & cut off sharp
for motion on closing the current
passing through the magnet ~~and~~
into the self induction current from
it and is weakened, ~~but~~ but quickly
gets full strength as induction current
dies away on opening the Extra
current from the magnet has no
place to circulate it being broken
entirely by the perforated paper.
Current goes on the line & producing
to make the record clear & not
be thin.

- - - - -

As has been previously mentioned
the EMU record whether it is
no static is thus with a sharp
current.

- - - - -

I thought that the above would
compensate & make it even for

4th 18th Extra Memo

Someone could do nothing
probably because we had to use a
short, and the secondary change
from the E.M. 4. throw it out
of adoption, as above decided

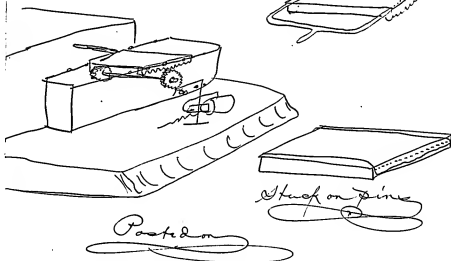
I find that it would do to
have a light a possession
the day of the E.M. 4.

The delay is apparently
increasing pressure =

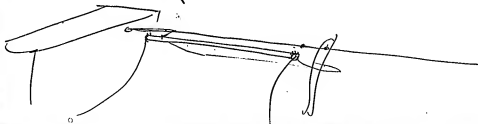
10.

~~to be done that several
advised that it was not
possible to do so~~

The signal may
be repeated by the EM. & G.
~~give best results~~ & a more delicate solution
or it may be recorded by
Em. & G.

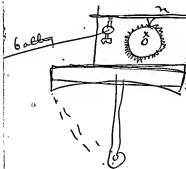


glass base or thick glycerine
to only stick it or hold it by
Quatern & 4 pins to keep from
moving



instead of connecting the vibrating recording pen direct to line it may be put in a mechanical connection with the pen.

On the paper to be recorded upon may be vibrated & the roller or pen in the lever of the pen may record in ink or have a vibrating pen attached which deflects the pen.



~~It is suggested that~~
~~by a clock control~~
~~which can be vibrated~~
~~the pen. the pen~~
~~is not at the pen~~
~~position.~~

7
T. A. EDISON,

10 & 12 WARD ST.,

NEWARK, N. J.,

187

Mention a paper mentioned in some
solution which lying on a metal
like hydrogen or Oxygen will
reduce or make an electrode
~~on surface of the paper~~ ^{metal} underneath the
paper so as to make it rough & use it
for repeating (3)

Mention that the apparatus may be
worked duplex.

Say that Embossed writing is a valuable
pen like X. ~~Chickens~~

~~of use~~ of paper written with a
Salaf-Bicard-K if stamped will
raise up $\frac{1}{16}$ of inch which can be
used for opening & closing
chambers

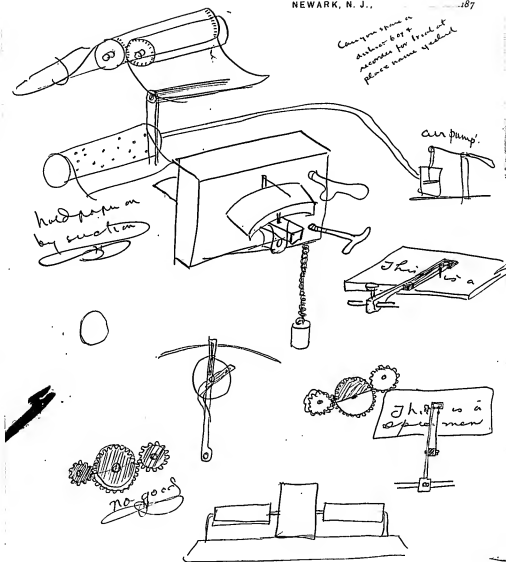
Relating to Fac Simile

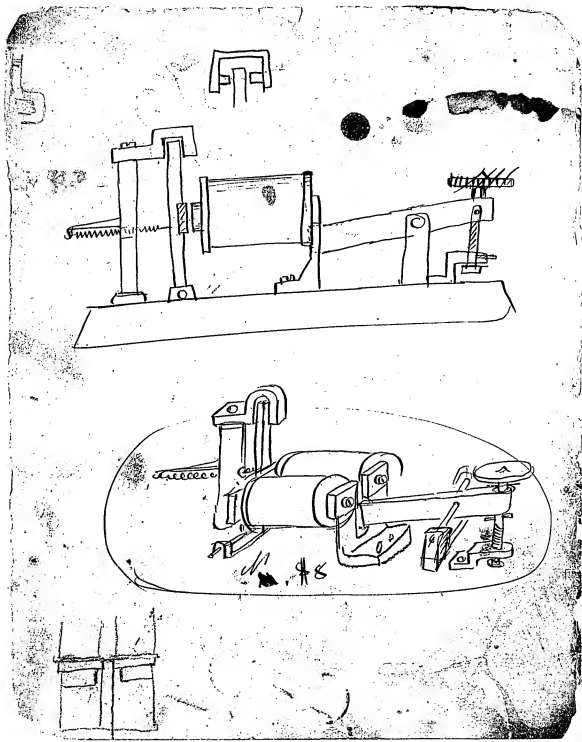
T. A. EDISON,

10 & 12 WARD ST.,

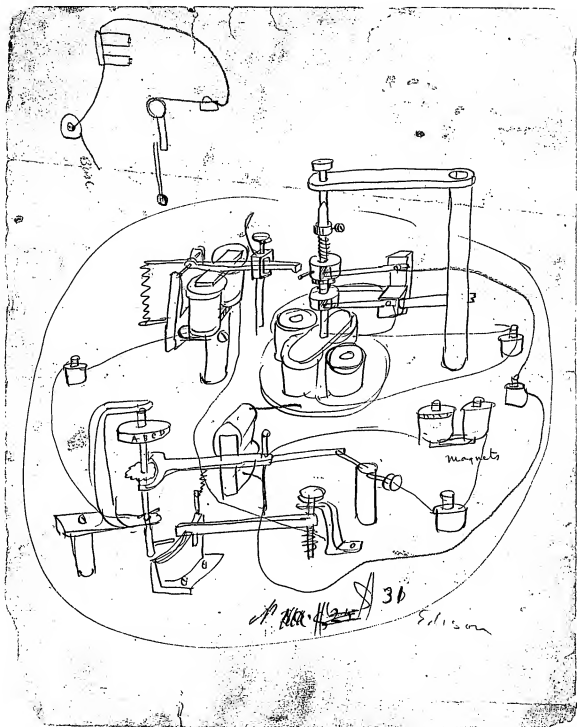
NEWARK, N. J.,

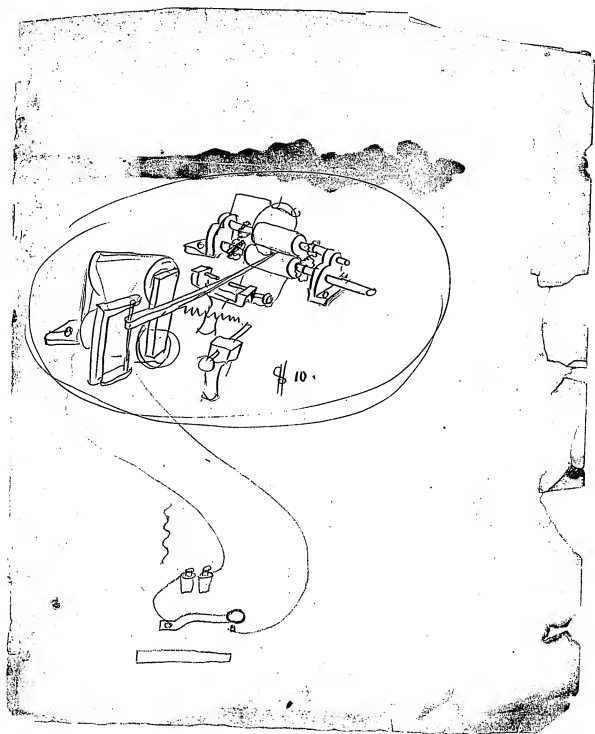
187

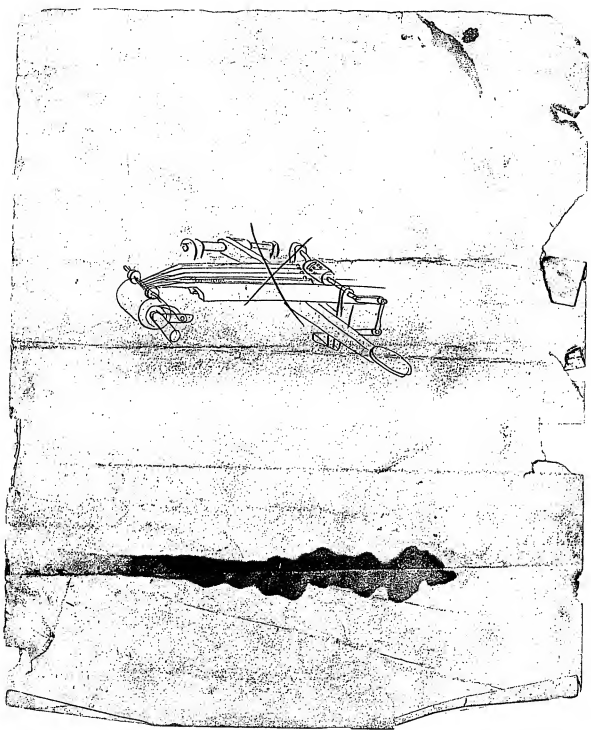


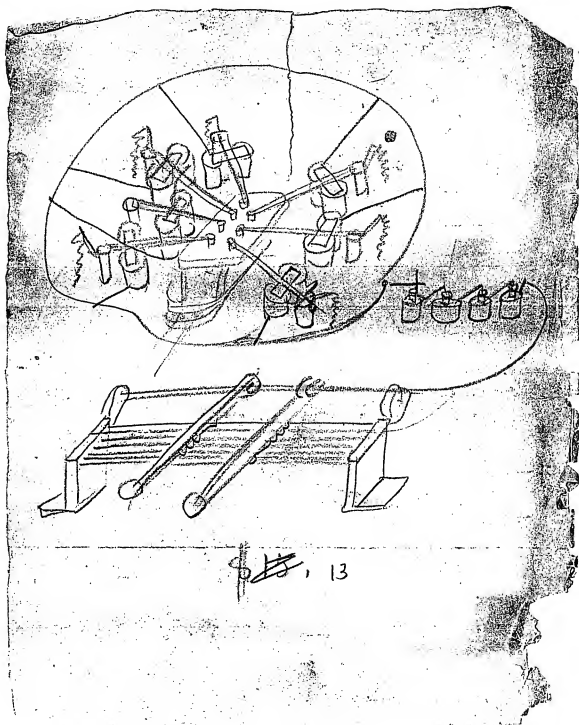


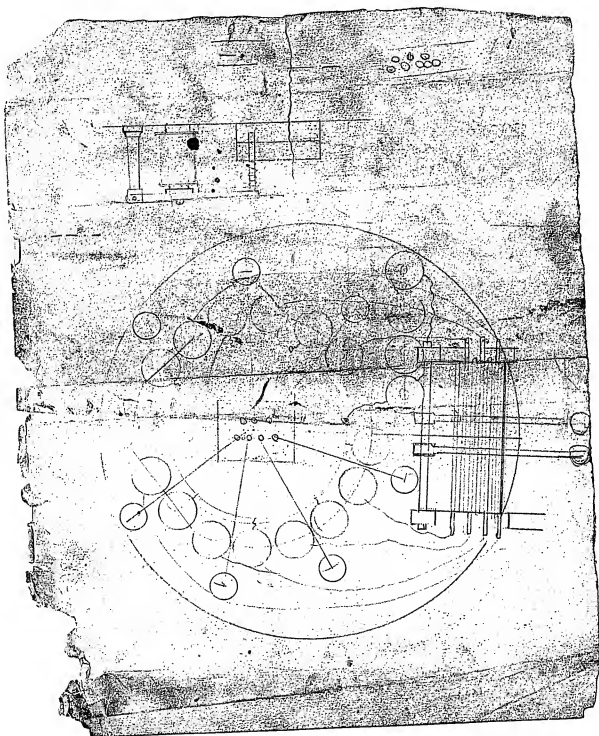


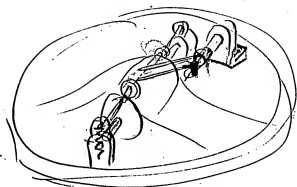




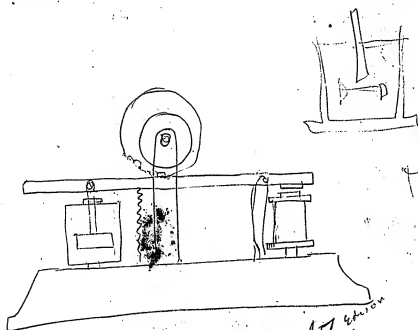




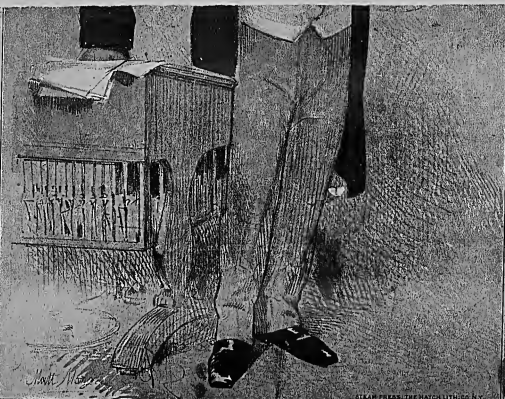




\$6.



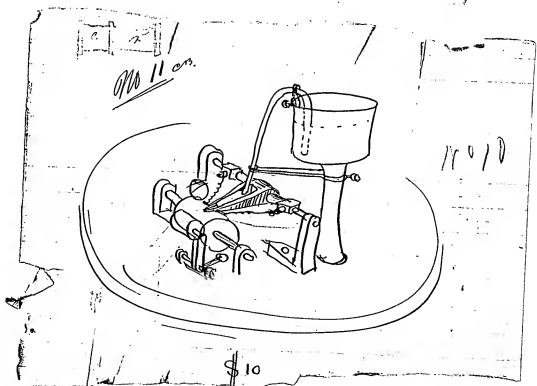
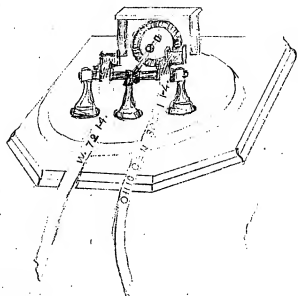
\$76 Edison

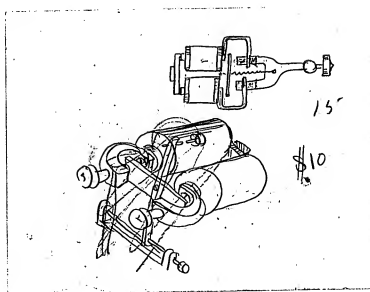
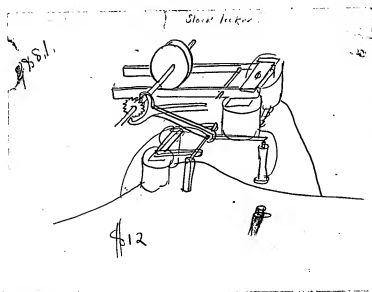
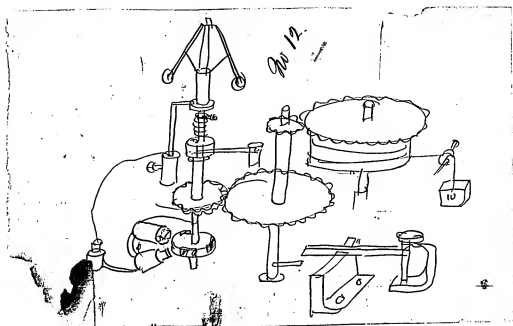


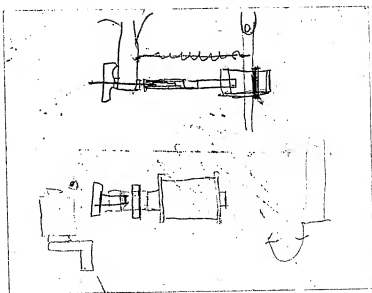
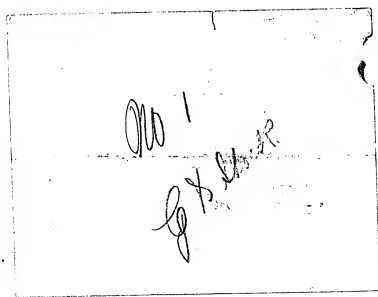
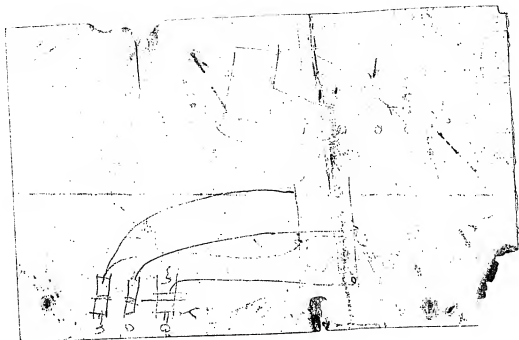
ALAN PRESS, THE PATENT LITHO CO. N.Y.

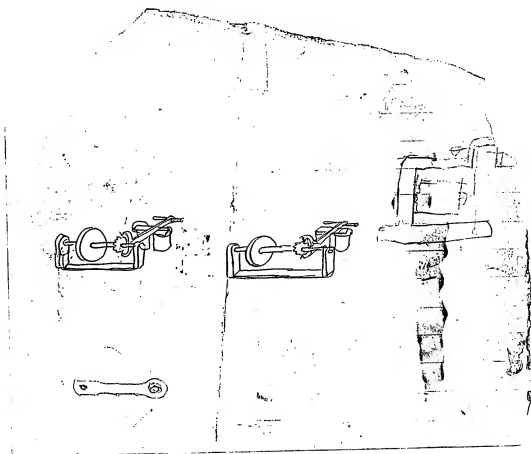
STATESMEN No. 1.
"Amnesty and Equal Rights to All."

FRANKLIN'S ILLUSTRATED MAGAZINE



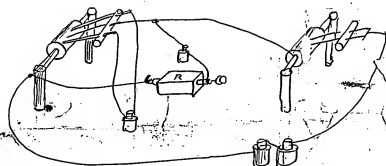




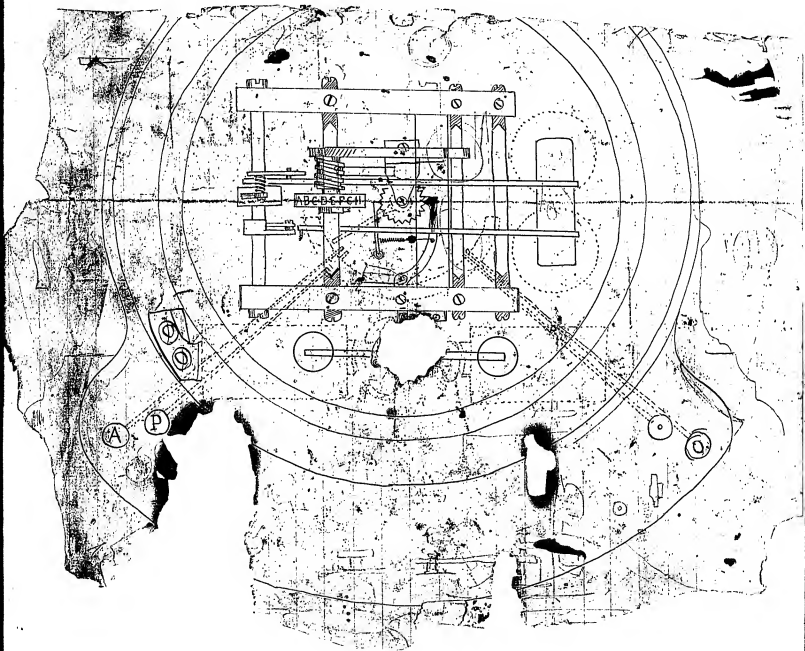


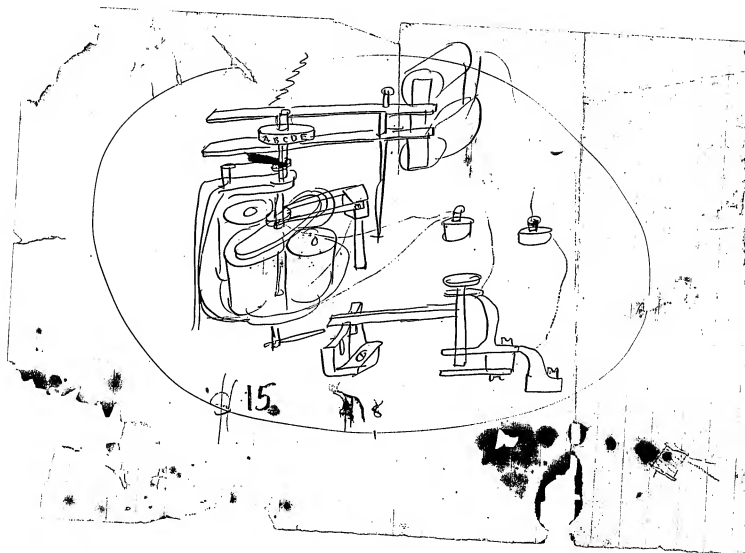


No 1



\$10.

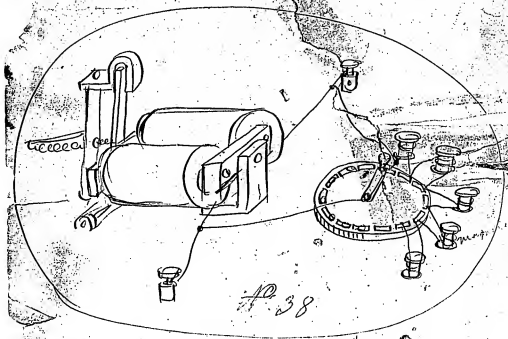




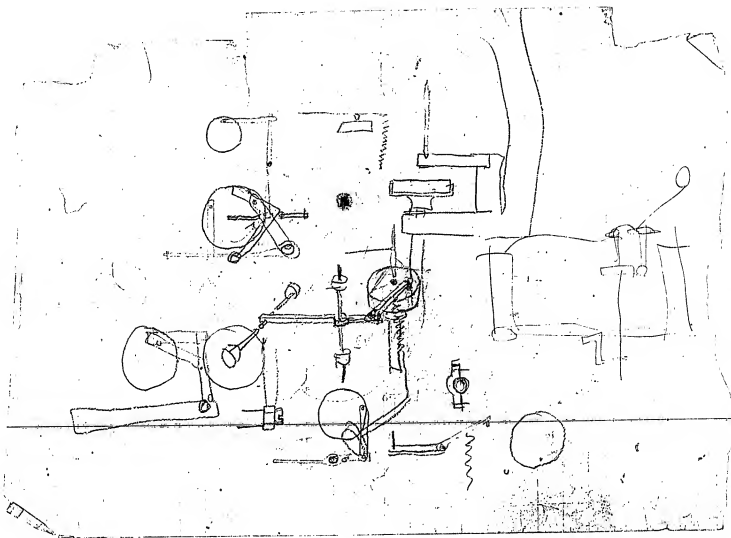


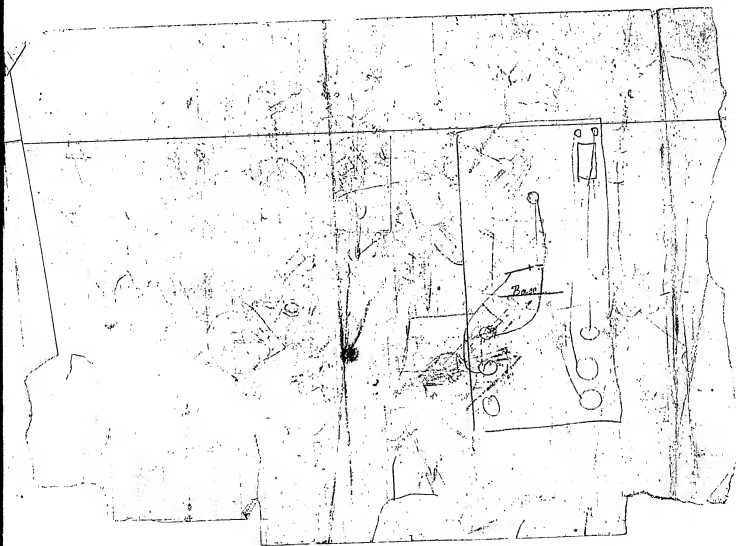
Telegraph ?

Apr 14



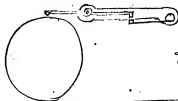
12



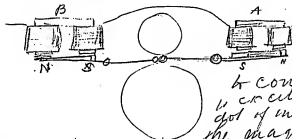


bars & so draw the upright over far enough
to feed for the length of letter.

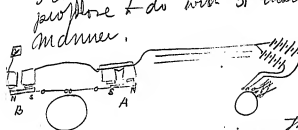
The transmitter is simply a drum
with 5 adjustable levers or provided with flat
points at one end & cam for
lifting at the other & pivoted in
middle. I can put these all at
one side of drum or 3 at one side
& 2 at the other



The Receiver or Reporting Syst. is composed of a
drum driven by clockwork on which run 5 rollers
these rollers are fastened a
levers pivoted in middle
& the other end is supplied
with polarized armatures
each roller has a magnet
to control it & when its magnet
is excited the roller makes a
dot of ink on the paper. When
the magnet is not excited the
roller rests back on the paper by spring.



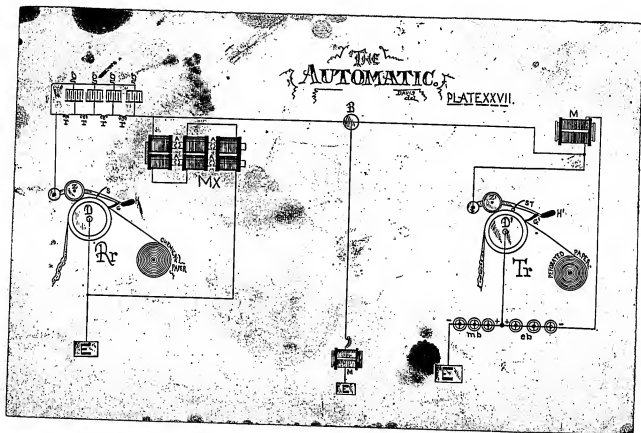
It would appear that having letter composed
of five lines & receiving a letter composed of
five lines made by five different rollers controlled by
5 different magnets that it was necessary to use
5 different words to perform the operation. This
proposed to do with 3 instead of 5 in the following
manner.



The first 2 pens on
the transmitter are set
one ahead of the other
so that the first sends
a positive current along
the line & the second pen
a negative current directly after on the same line
these are received on the magnets A & B which
polarized armatures respond one to each current negation
& position making 2 dots of the letter on one line 2 more
dots are made by the next 2 on another line the other
dot by the other line

THE AUTOMATIC.

PLATE XXVII.



6
Good paper will show
a good black dot with
1 cup of battery through
1 million ohms in 6 seconds
with 5 cups it gives a
good continuous mark.
Capable after a day
100 cups do per minute

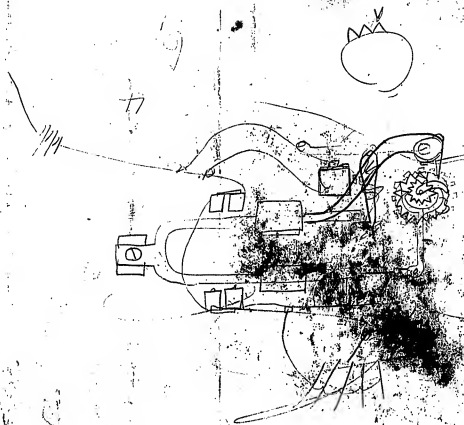
Decreasing the thickness
of the paper does not
materially ^{practically} decrease the
resistance

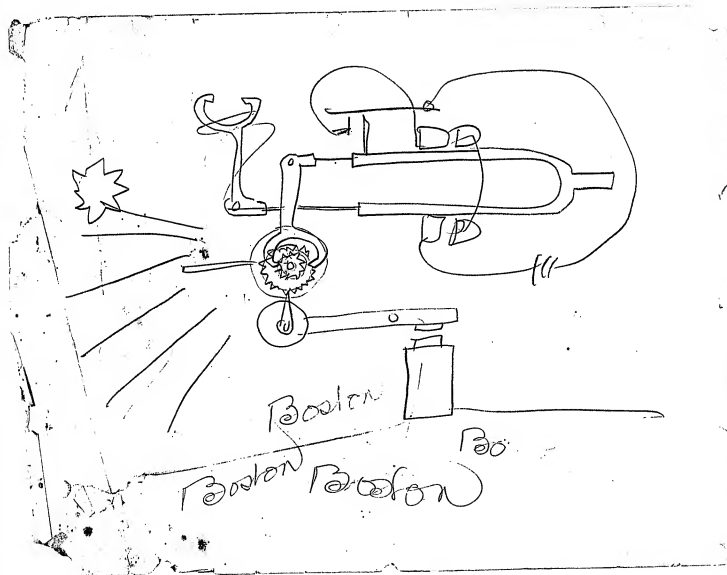
2. Sulphocyanide of pale
to which is added Hydrocyanic
Acid or Muretic Acid.
(Put formula) White mark
is recorded on Red Rock

Logwood wood solution
find out more about =

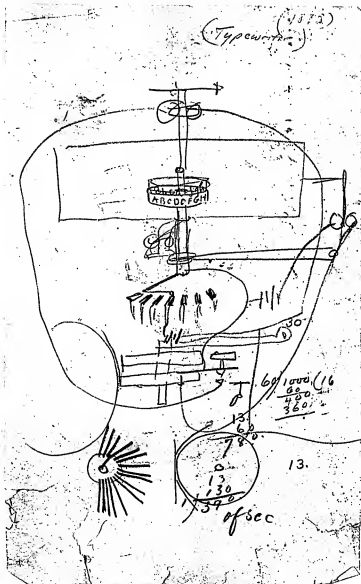


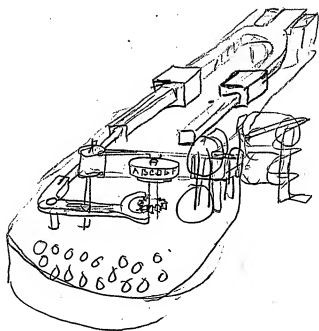
Acoustic Printing

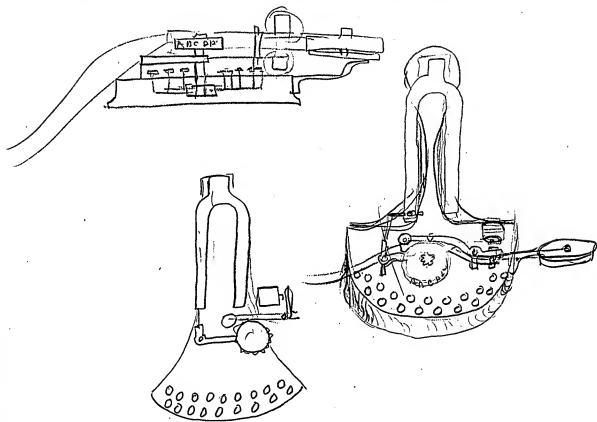


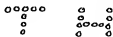


(Typewriter)

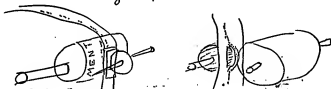








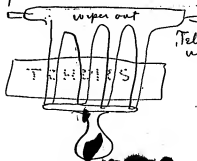
Band.. One pen.
clockwise turn to other,
reverse like dot & dash
when reversed wind on
an exact drum then transfer
also cover drum with paper having
auto glue!



~~clockwise~~

punching out & transferring
also transferring ^{marks} by pressure
on specially prepared channel

paper -



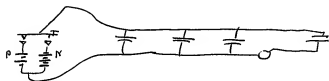
Tellurium
use Hydrochloric Acid
or Electricity

20000
bunch

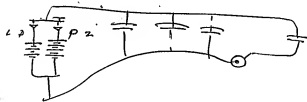
Sketches + notes

4

It might be done by sending every succeeding word with a higher battery power



K Battery 40. P Battery 40 Variation



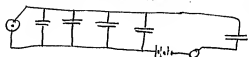
P 2. 40 cells. P 1 20 cells! Variation

90
5
6

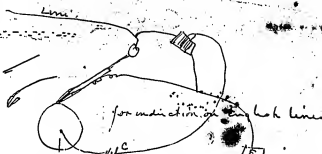
Cable



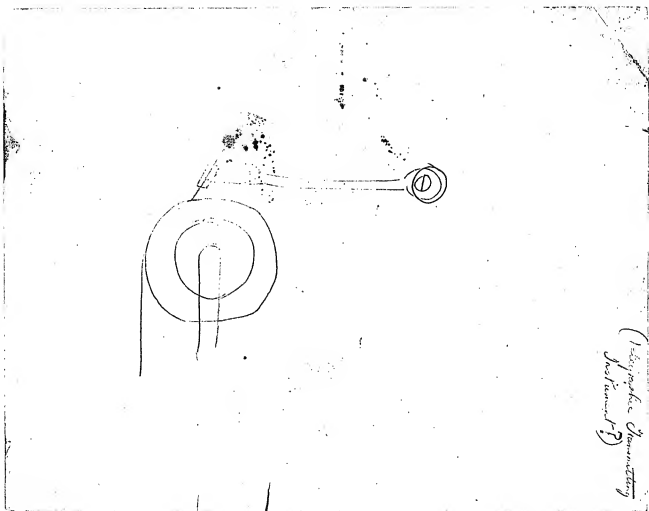
5



40 cells. Carbon Tellur



Thus the both try on W line
with a recording Counter



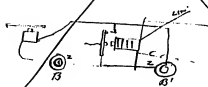
(1) *biologische Chemikalie*
bestimmung

opened & closed by the relay P in the main
 The others are worked by a lever which ^{is magnet in lower}
 may be shifted from one escapement to
 the other by separate Electro magnets or by
 a mechanism controlled by the relay
 & separate Electro magnets, Type W relay 2 magnets
 He says that the printing may be effected
 by any tally tally gear combination
 He describes a momentum wheel which is
 kept in motion when the type wheels are being
 operated but which comes to rest when the
 type is stopped & allows a clock
 escapement which releases a clockwork
 to drive some other form with which
 it is done This principle is same as Callahan
 fly wheel arrangement on Bank inch
 describes working several motor typewriters on
 one main line, the first motor being in the center
 to get extra copies

secondary discharge from the local magnet which reaching in the same direction as the battery current tends to prolong the time of demagnetization. ~~Fig. 3 is a modification of the plan the above plan.~~



Fig. 3. Shows Fig. 3.



The two batteries are included within the common local circuit ~~and one the zinc pole of one battery is connected to the zinc pole of the other battery, and connected to oppose each other, with their like poles facing each other, when if the lever of the relay remains unaltered the solenoids neutralize each other and the local magnet is unaffected.~~ If the lever of the relay be brought forward one of the batteries the circuit

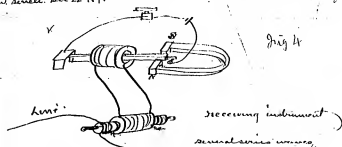
In the autographic facsimile I propose
to regulate the two Electric Engines driving
the recording and transmitting
mechanism (or perhaps I shall use small
power such a Clockwork) by a fork
or reed at both ends of the line
in a local circuit controlled by
the main reed or fork relay, on
a controlling wire, perhaps I may
be able by the use of a ratchet wheel
& pawls or V-shaped wheel & fork to
drive the mechanism entirely by
the local fork = On the other hand
the idea occurs that the recording
was of a line may be done by using
the wire $3/4$ of the time & using
the other $1/4$ to actuate a reed
or fork to regulate the mechanism
& perhaps I shall be able to transmit
recording by chemical recording

We now conclude that lower forks will
give greater margin by giving more
time for the line to discharge
we are going to put the chemical
instrument on the low fork and
ascertain its rate of vibration,

Then we are going to turn 2

Duplex relay sounds with a
transmitter and see how what is
the lowest number of vibrations
per second that will allow good
rapid signalling. Then intend
lowering the vibration rate of the
forks if it is found that they can
be lowered with advantage =

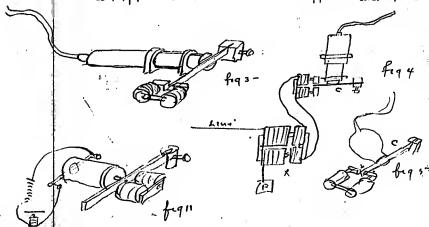
Current 73 - nd ~~stayed~~ about Dec 75 - 1 signed only in Jan 1976
 sent small Dec 22 1975



use of induction coil to throw unbalancing into reverse currents to increase efficiency, = Polarized receiving instrument, if this has nothing to do with Spley- let them meet if in writing

Current 74 - ditto as above.

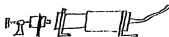
applies to Case 145



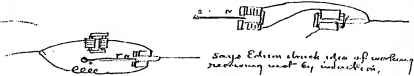
Current calls X induction coil = says that the c springs may be in time with the waves or "out of time" and - spring rests on soft pads between the poles. WEL Contract Dec 14 1975 - or Acoustic. = just saw account Reiss Tel in some "pamphlet" publication in 1972 or 1971. I think, = 2nd Wilbur for his lawyer affidavit dated

Bachelors small book speaks of AX night in telephone Sunday
Nov 11 1876-

Spice came to work Nov 29 1876-



Bachelors book gives
date Dec 21 1876-



Says all night in work Sunday 23 - Telescope arrangement got
them to work only 2 stations, but there was no message.

Thursday 30th got 3 messages perfect by throwing in 4000 batteries.

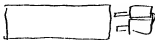


Dec 22 Batch paid Bill #12 for tubes,

July 6, 1876 - Adams writing

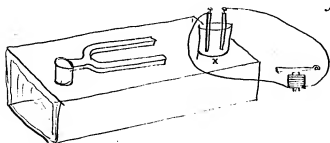
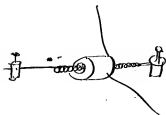


Says long brass tube with felt wet with Water & Salt & water.
for receiver used parchment with iron pasted on, and magnet
Says gets good many words plain such as "How do you do"



receiver Tapered

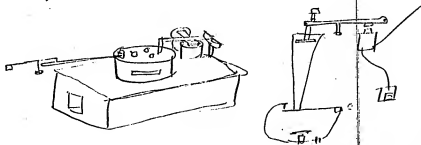
Nov 16 1875 -
within, Batch.
Edison
Keweenaw



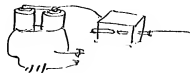
Nov 16/75 -
Batch, Edison and Keweenaw

x - quickly polarizing battery which depolarizes powerfully with lead
for as tuning fork responds only to vibrations in unison with its
surrounding time, this will respond for young. Keweenaw H. bubbles
to-morrow chance.

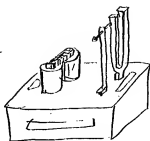
Nov 26. E & B - 1875 - 9 say material breaking dit like Gray show in 1 out
batteries same age. preserve continuity & also show this



Nov 26 -
Jan 1876 - Edison -
E & B.



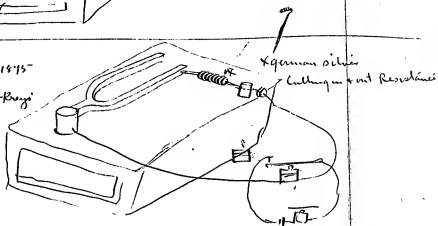
Page 7



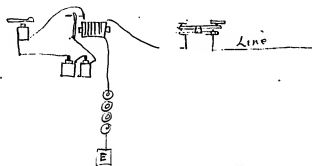
Nov 12. 75 = E-B. Adams E.H.G.

Nov 16 1875

E-Adams, B-Buys



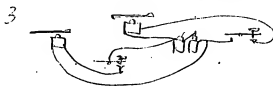
To make set up a Relay Key & Sounder



To make a local circuit with Key & Sounder



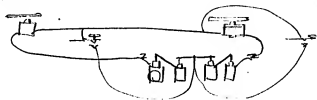
To work two ~~local~~ Circuits from one battery



To arrange a circuit with two Keys and two Sounders that shall be operative with

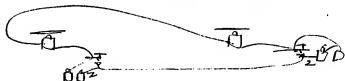
the Keys open

4



or

}-



to make one cylinder open and the other close
when a key is closed

Another Mode



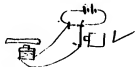
to combine a third key as in 5-



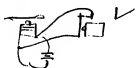
to work a local circuit with sounder by relay



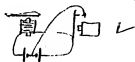
second plan.



third plan



fourth plan.

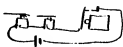


fifth plan.



to make one relay close two sounders

first.



$1\frac{1}{2}$

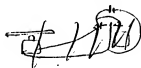
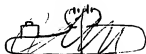




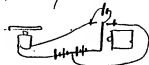
To make a Sounder Close & open when the Relay armature is brought forward



Second.



To make a Sounder Close & open twice when the Relay lever is brought forward



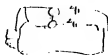


to keep one sounder closed and vibrate the other upon one circuit

first



second

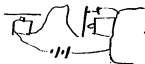


to make one sounder close and the other open



to make A close with the Relay. and B
~~close & open twice~~ open & close
 Double the Battery C

to make a self vibrator



add battery to the local until it will exceed by a small fraction the effect of the main current in the relay. it must pass through the same way in the reverse direction to the main.

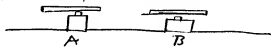
Simple vibrator



Vibratory Movements to produce two distinct Movements of magnet levers independent of each other.

first.

Without Local



to work at A not B, have a light lens or send with 10 cups.

to work A & B send with 20 cups.

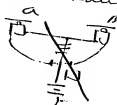
to work B and not A, send with 50 cups.

to close A and then close B ^{put on} add 10 cups to close A, and then add 10 to close B.

B

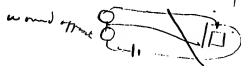
Call Sounder Magnet

to work two sounders separately

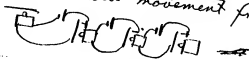


~~to make A work pluggish & B stop~~

to work without breaking circuit

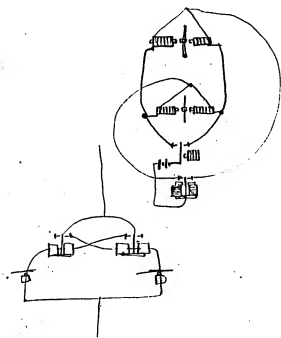
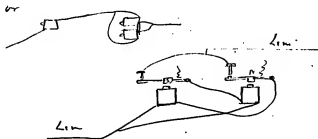
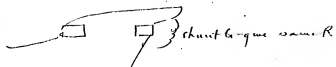


to obtain a slow ^{repeating} movement from a magnet

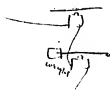
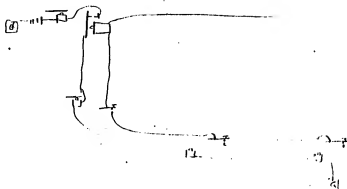


to obtain a still slower





4



short circuiting leads



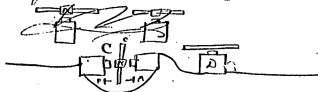
Second.



Transmit short pulsations ~~and B~~ will respond but A, owing to its length has a greater change in discharge time hence will not respond. Hold the current on permanent and A responds. The charging & discharging time of A may be made greater by slipping over the iron core a brass tube, to increase the discharging & discharging time of B. Saw a slot longitudinally ~~into~~ to the centre of the iron cores from end to end,

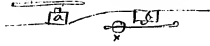
to increase the swiftness of these movements, make the length of the waves equal to the intervals between - and to still further increase it reliability. ~~transmits~~ the waves with say 20 cups. Positive and space with 5 C.p.s. negative, to keep A closed permanently while ~~that~~ B is vibrating increase the length of the waves and decrease the intervals of time between says 2 to 1.

Third =



Send Positive and negative waves the cover C being provided with a permanently magnetized armature goes from right to left back and forth with

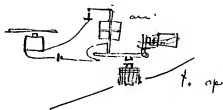
Each reversal while the Electro Magnet B will remain completely inactive when the reversals are rapid & to bring D into action ^{Keep} ~~switch~~ ^{switch} upon the positive or negative waves for several seconds,

fourth 

a & b are two Electro magnets the retractor force of a being a spiral spring & that of b a weight - both having the same power of rapid pulsations are now sent the lever of A will respond while ~~that of b will be unable~~ the magnet b will not have sufficient force to be able to overcome the inertia of the weight if the pulsation is prolonged the lever & weight X is drawn towards the face of the magnet.

The lever may be held thus & a made ^{by} ~~increasing~~ the length of the following pulsations and by diminishing the wave same number of waves per minute but increasing the length of the waves and decreasing the space gaps or in other words allow the waves to remain $\frac{3}{4}$ of a second & ~~diffuse~~ $\frac{1}{4}$ of a second.

f.f.h



add to

S.P.K.



Oscillator without second circuit, the second
 Magnets ~~blow~~ obtaining the current from
 derivations
 first



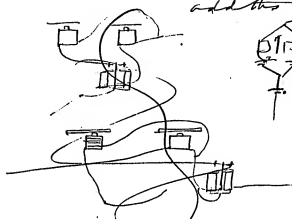
The transmitting batteries should be of low
 resistance

17

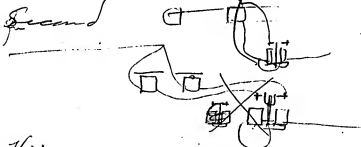
add the source



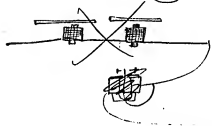
Reverse
Miscellaneous



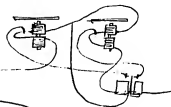
Second



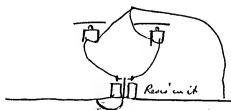
Third.



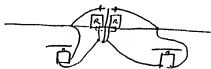
18



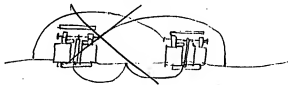
fourth



5th



6th

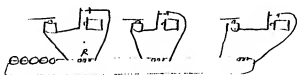


8th

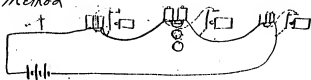




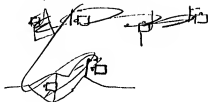
fourth method.



fifth method



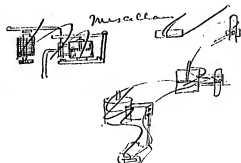
sixth method

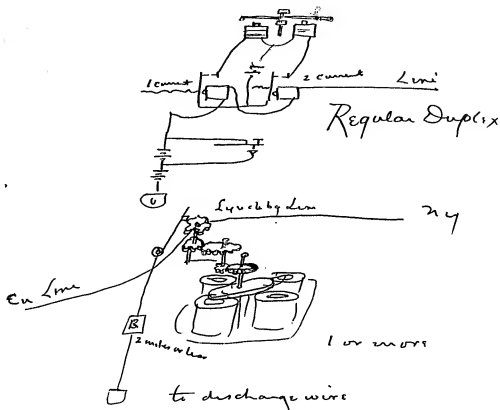


6th method

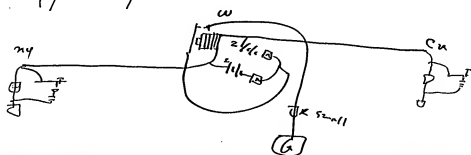


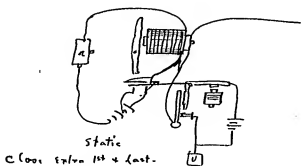
When the relay leaves rest upon their back points the current passes through the local magnet in opposite directions and produces no net effect, but when ~~one~~ the ~~other~~ relays cut current is broken through one relay by the action of the other relay leaves the ~~remaining~~ remaining relay become active and the switch "close"



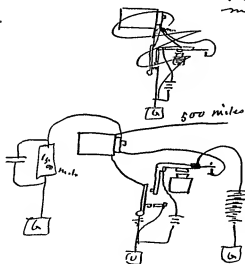


Repeater for Auto



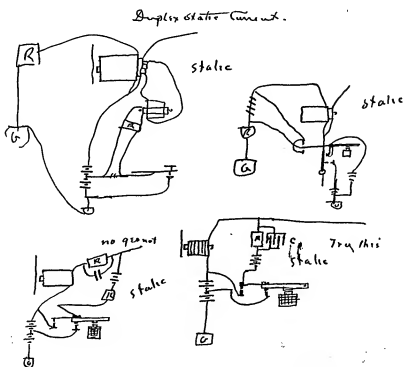
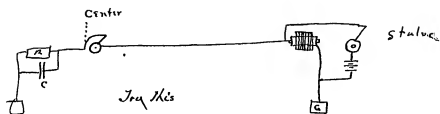


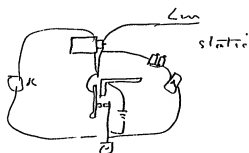
increase & decrease
at moment of opening
& closing by mechanical
means for static



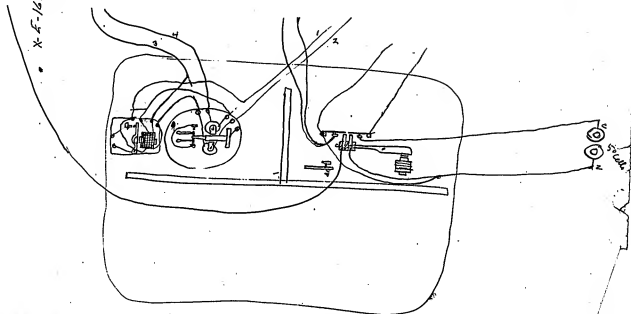
or make equaling
Relay coil lines as
strong as line coil
& double Resistance

Double battery

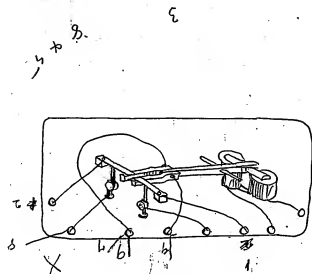


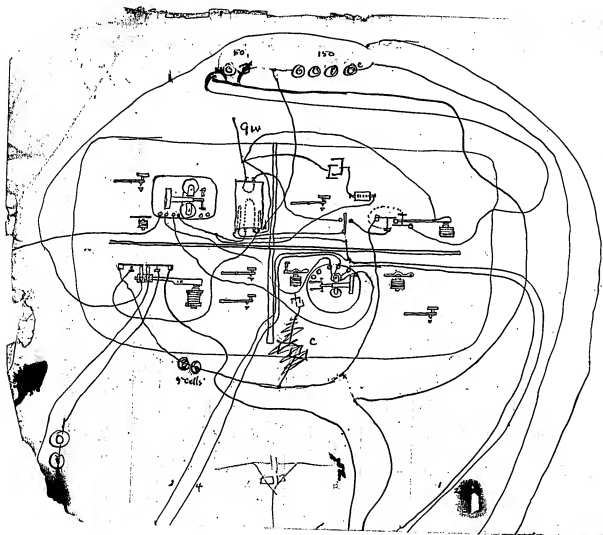


X-5-1684



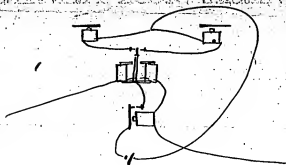
(X-F-1284)



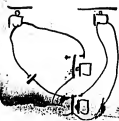
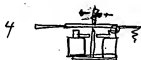
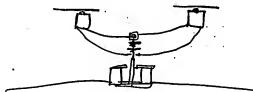
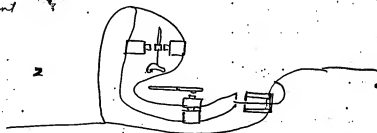


X-1-1694

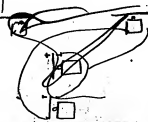
Two movements with local and polarized magnet

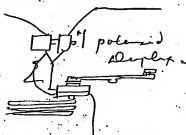
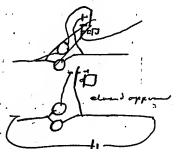
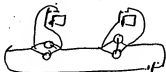
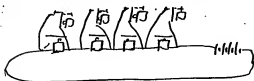
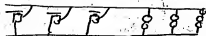


Movement

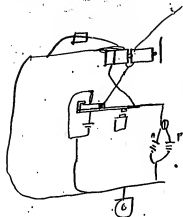


(motion
open & closed)

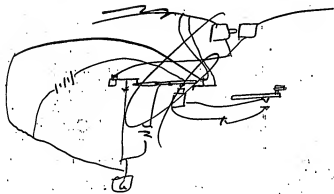


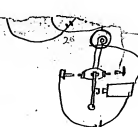


Local Compound

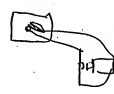


to prevent static

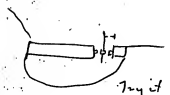




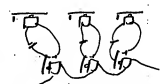
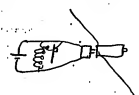
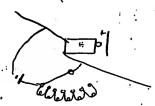
Val 2



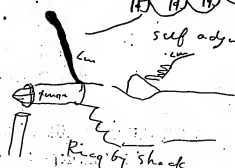
Val 3



Try it



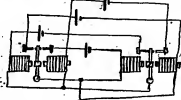
self adjust



Ring by shock

Self make & Break

Self make and break



Self make & break.

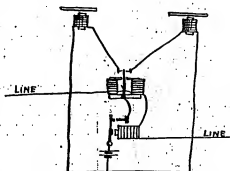
Show Sunflower

Kramers.

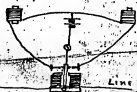
old Universal

slowing relay

Two movements by intermitting δ & π Currents



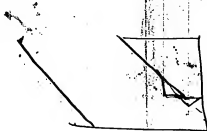
Second by a centered tongue



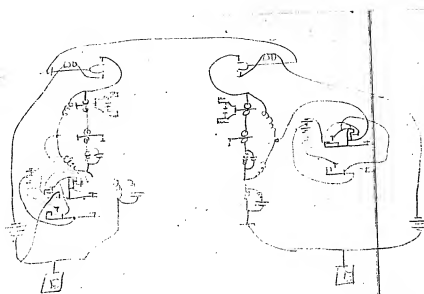
Shew Control & a reversal deep wheelset v

10 " " " dif.
7 " " 2 in same direction Wheelset, ^{difficult}
2 " " " Double principle
2 " " Also ^{with repeat way the}
" " ~~reversal~~ dif deep do " ^{with repeat way the}
" " reversal do " ^{with repeat way the}
" " reversal do dif
" " Shew ~~it~~ brought repeating on another
" " also into second Control
" " also " " double without fail!

Experimental



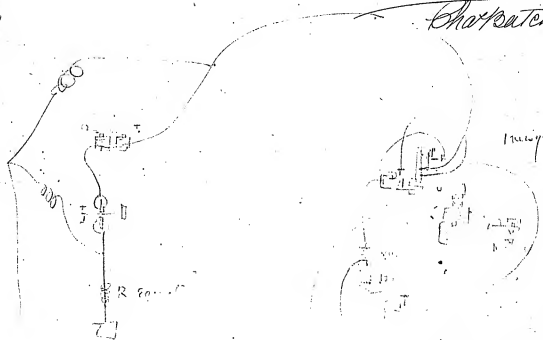
22



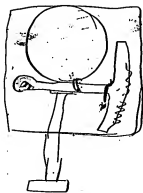
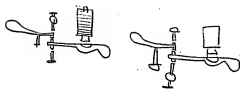
Sextuplex

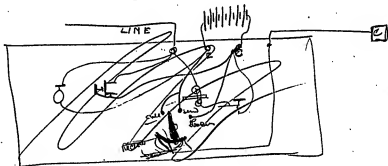
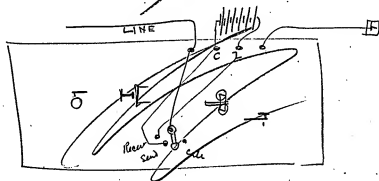
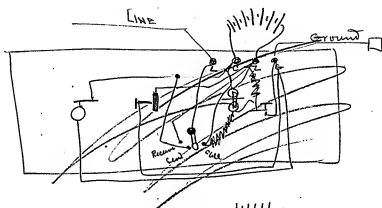
T. A. Edison

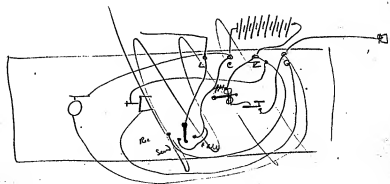
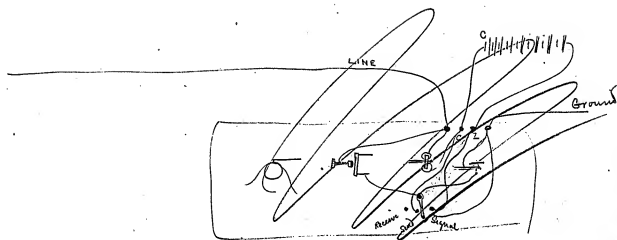
Chattanooga

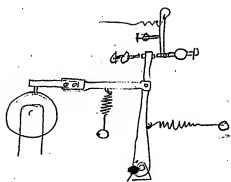
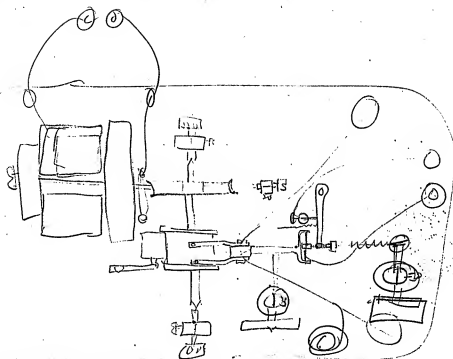


* X

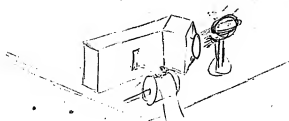


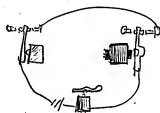
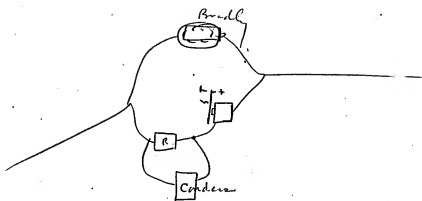




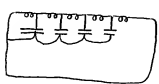
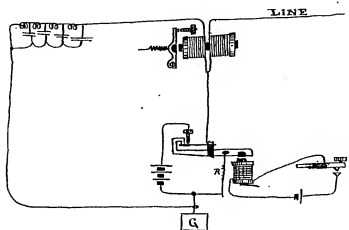


Emy

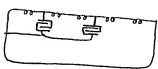




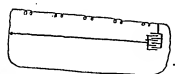
Simplex
Will - 1.



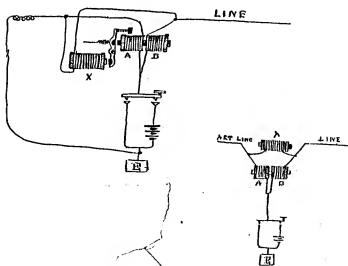
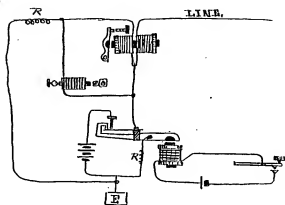
discharge. —



discharge —

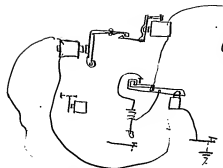


discharge —

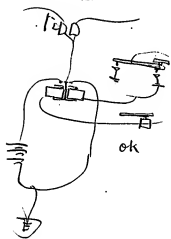


Book

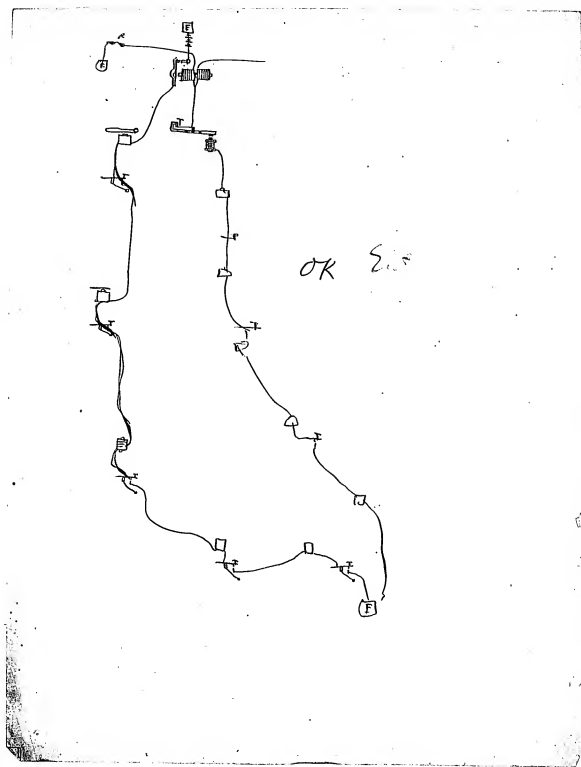
Book

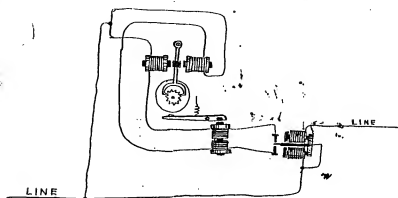


OK
 Sup I guess
 OK
 Ent

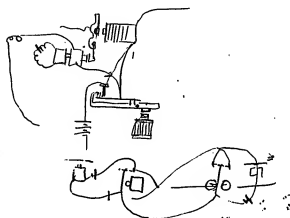


Ent

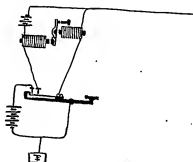
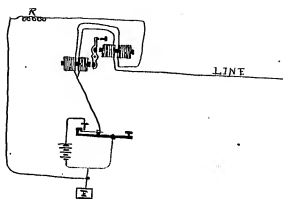


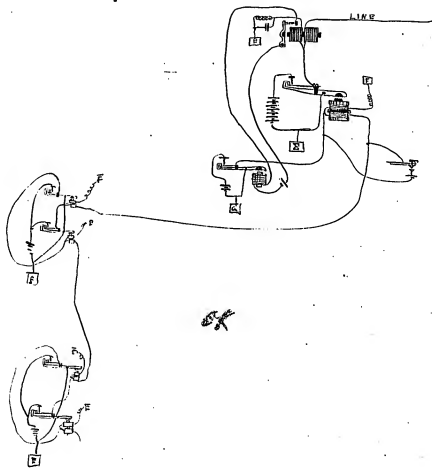


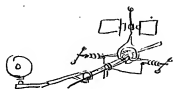
Not polarized - Reverse current



Try this



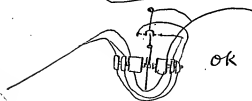
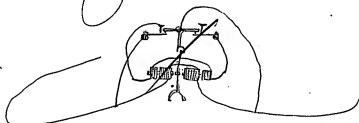
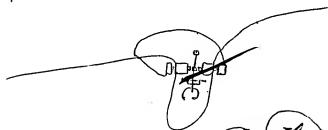




ok



~~OK not a catch~~

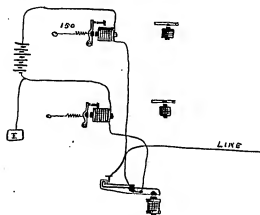


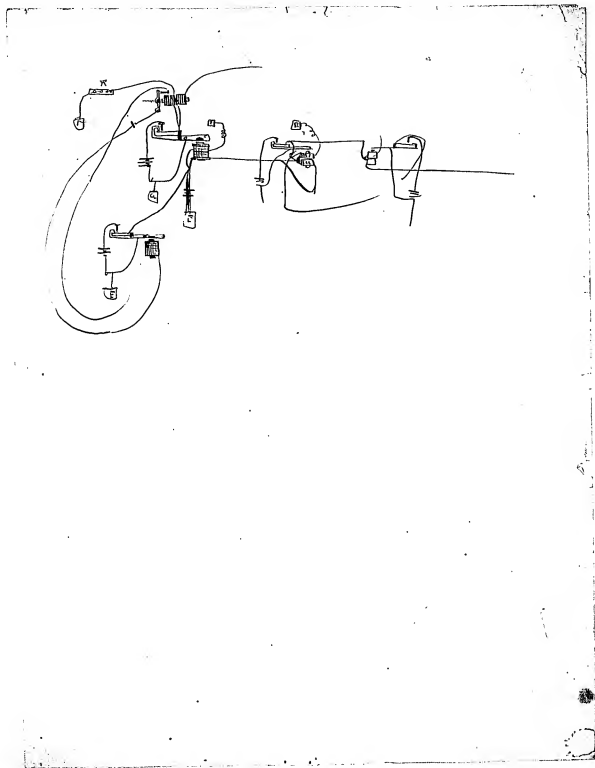
OK

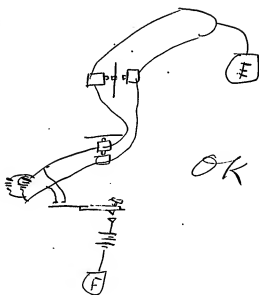
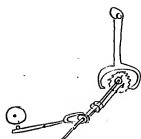


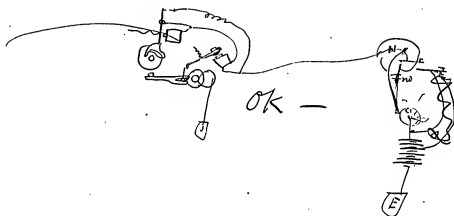
Regimen

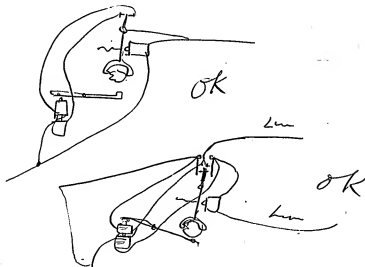
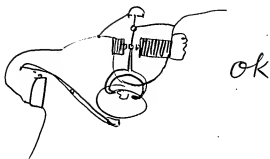
Revised

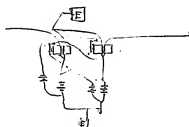


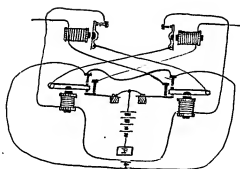
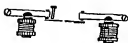
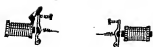


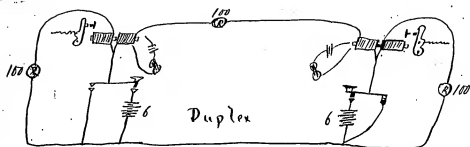




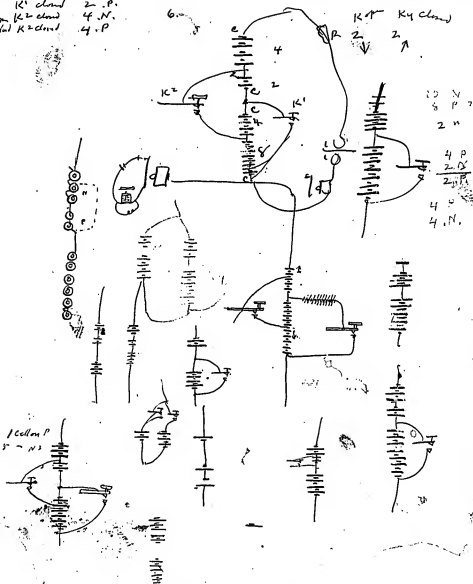






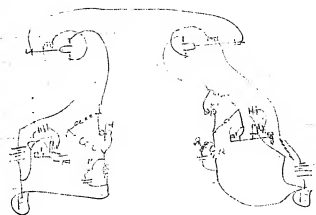


Both open 2 N.
 K1 closed 2 P.
 K1 or K2 closed 4 N.
 K2 or K3 closed 4 P.

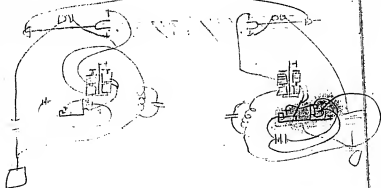


Sextuplex

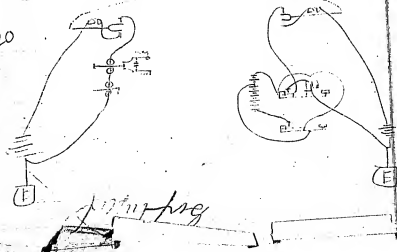
18



19



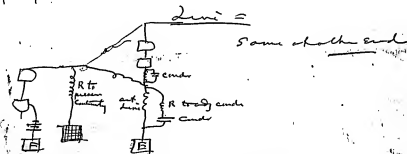
20



Acrobis transfer

Send four sets of vibration by opening
 & closing given battery
 Send 4 more by increasing the battery
 Send 4 more by slower vibrations
 + polarized relays =

Duplex it this



LINE

200 1/2 Rating
Straight Pulses

200 1/2 Rating
Straight Pulses

Pole piece

100 cells

Single Transformer

200 1/2 Rating

old wire out
of X
old wire out of
battery on old
sample sender

100 cells

Change from 100 or 150
+ wires on 150 or 0

Keep in _____
The Western Union Telegraph Company.

From _____

to _____

[Note: Write the words on each line.]

Keep in _____
The Western Union Telegraph Company.

From _____

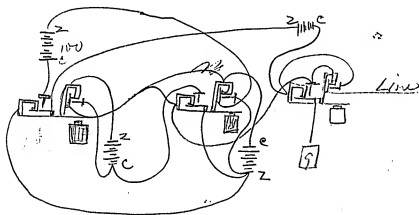
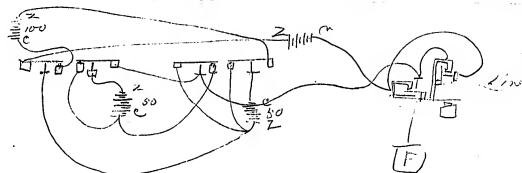
to _____

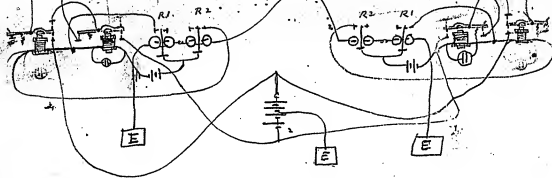
[Note: Write the words on each line.]

Letter _____

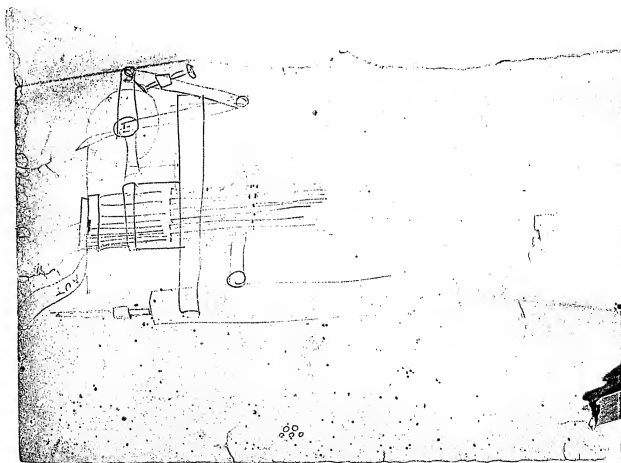
Sheet _____

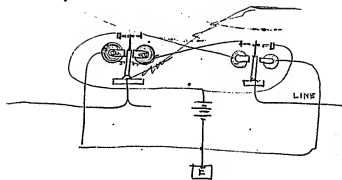
Handwritten notes and diagrams on a lined page. The page is divided into two sections by a vertical line. The left section contains a large circle with several smaller circles inside it, and a line drawing of a person's head and shoulders. The right section contains a large circle with a line drawing of a person's head and shoulders. The page is numbered 1 to 100 on the left margin.

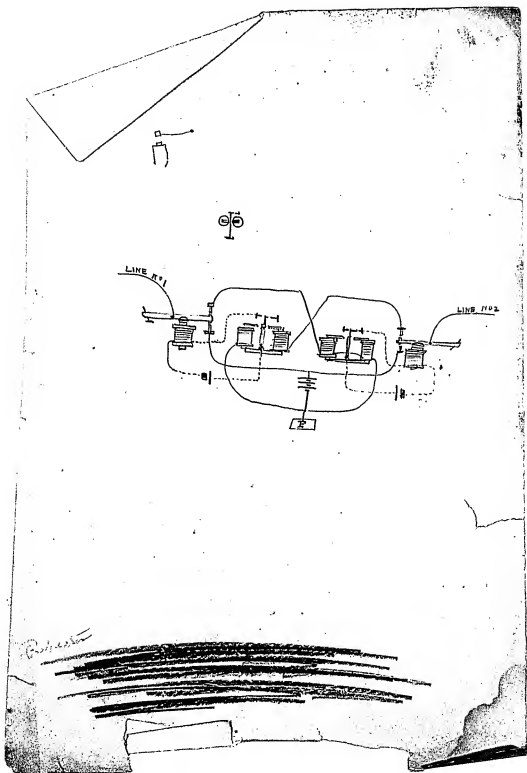




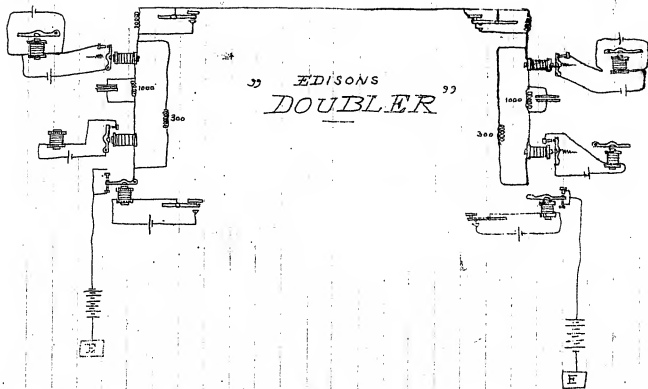
Output





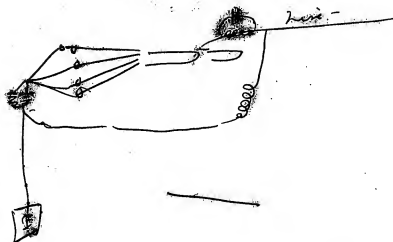


” EDISONS
DOUBLER ”



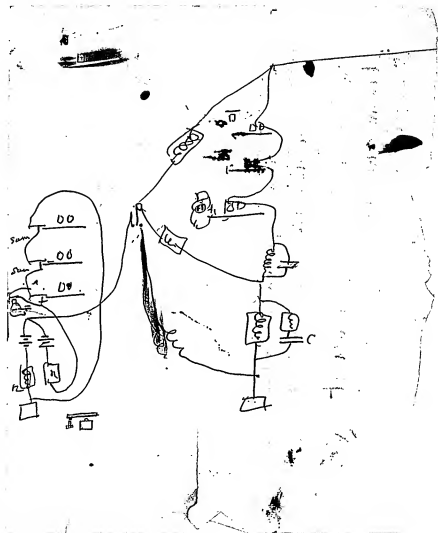
"Discharge Current"

The thing is, according to law
it ~~must~~ ~~be~~ ~~able~~ ~~to~~ ~~stay~~ ~~a~~
much ~~longer~~ ~~for~~ ~~longer~~



A *gemma* - quite soft
 like some *gemma* and
 very much like

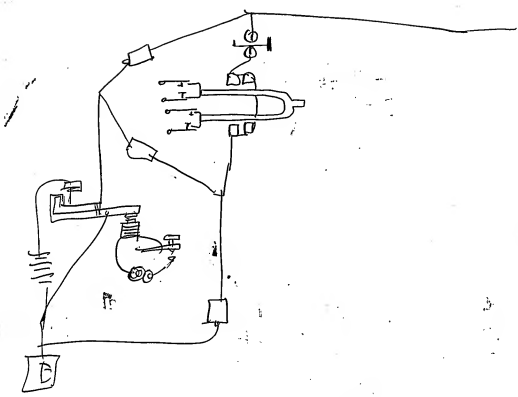




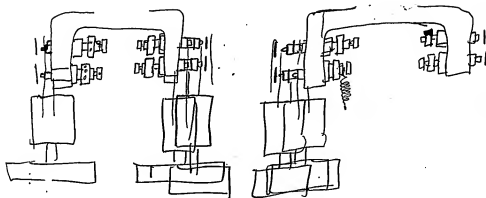
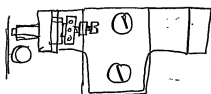
10
Rough on Automobile

You will notice in the package received
several large iron rods which are for the
purpose of securing to the back of the
battery plates the whole of the rest

In the course of human events it
becomes necessary to secure
unalienable

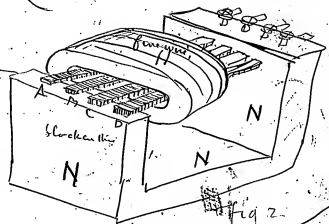


James Adams



102 instrument

6 reeds,
connecting them



Common

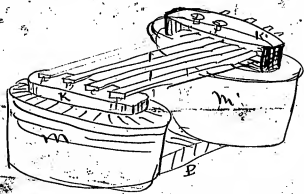
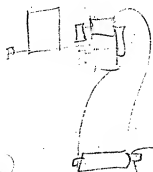
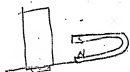


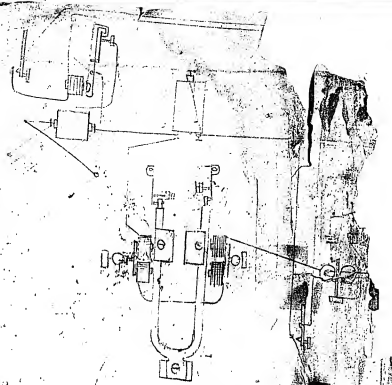
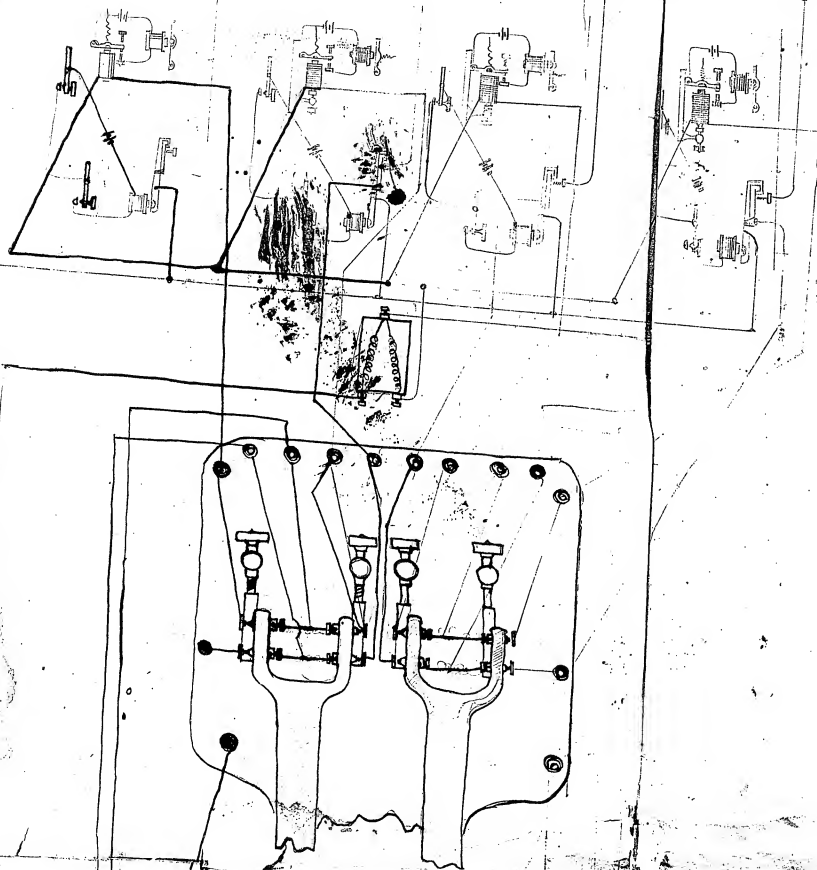
Fig. 3.

103 instrument

②
 -E- acoustic Tel. arm plate.
 Mag + source electric
 Energy -

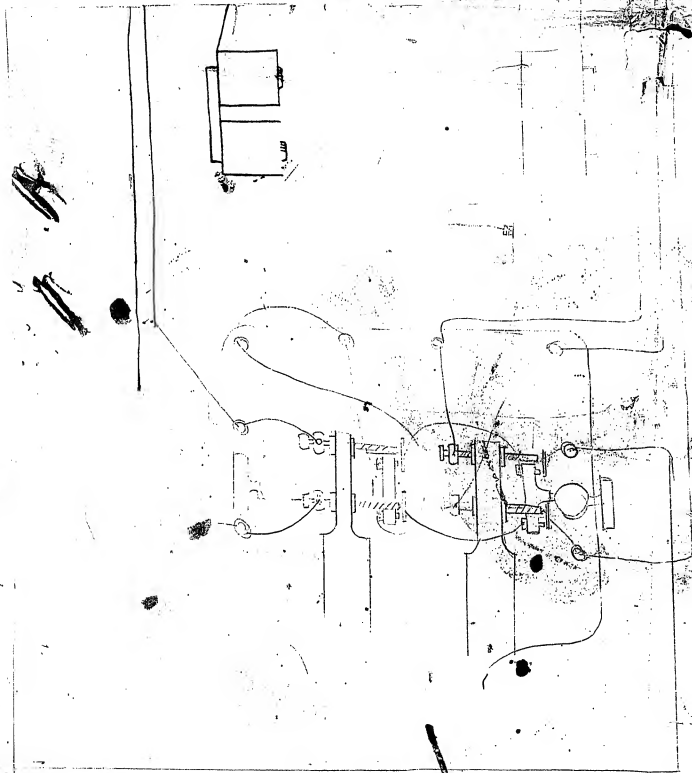


G - Recor, Carbon Mag. Dia.
 won dia -



225

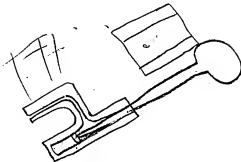
[CONTINUED FROM THE PRECEDING FRAME]

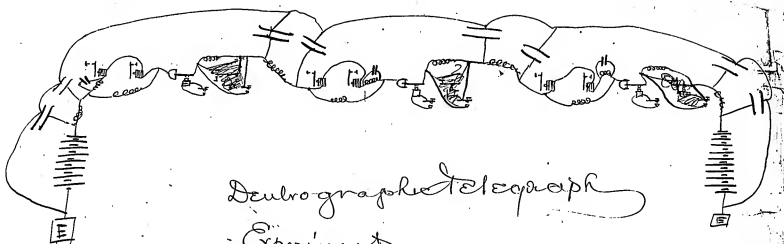


9

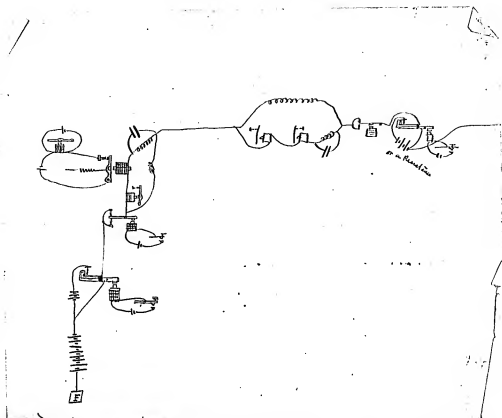
200

6.2.0
High
N/A



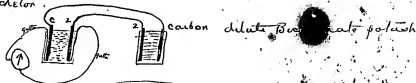


Dubrograph telegraph
Experiment
Mikhalic Devices

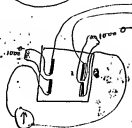


Railway Double Telegraph
"Dento-graph"

Batchelor

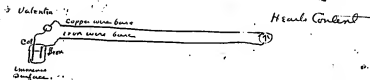


also



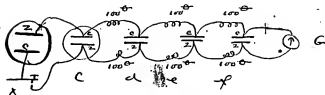
Same as above

Idea

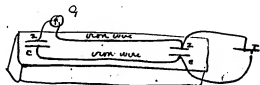


Cable forms battery, which when open opposed by artificial battery at Valencia, gives no current at Heart Content, but when disconnected at Valencia, forms an immense cell with of 1 Cup Electromotive

Sketch

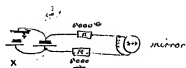


If you can get signals through to the Gal
G by working the Key X then we can
telegraph over the Atlantic Ocean with
bare wires, get batteries C D E & F
as near alike as possible, use
Carbon batteries that give same
deflection on Bradley No. 4.



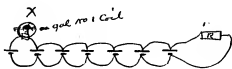
Trough filled with saturated
Solution Chloride Sodium,
if closing Key we move 9 then we
can work through ocean with
bare wires

Experiment 1



Ascertain if adding the second battery
 X will increase the deflection of the mirror if
 not am afraid we are gone up on the
 bare Earth Line,

Experiment 2.



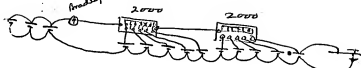
insert Bradley Galvanometer at X. and put 10,000
 ohms and see if get any deflection, only
 then reduce R till get deflection.

Expt 3:



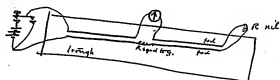
Experiment 5 same as 2.

Probing Mirror both -

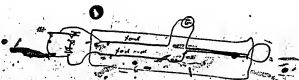


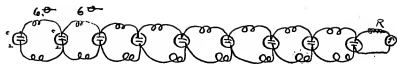
If this works Mirror well then Baracore is probably OK =

Experiment 5

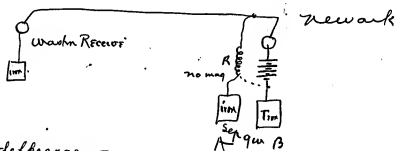


also





6 ohms between each see what R can be forced with 6 ohms between each & nothing between each.

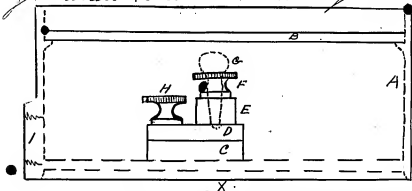


See diffrence =
Then dotted line,
also try a zinc gw in place A.

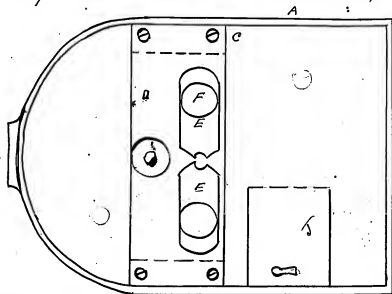
New test box for the Domestic Telegraph Co

One of main objects is to keep water out.

The box as will be seen is set on at X
so that if water gets behind it cannot
get inside. The door also goes in



nearly $\frac{1}{2}$ inch. The blocks E are placed



on Hard Rubber piece D which is isolated from the box by lugs C cast in box so that there is about $\frac{1}{16}$ of an inch between rubber & box. The wires are fastened under blocks & the screws F are loose simply for holding the testing wire.

J is a lock & not a Yale at that. There must be a gas pipe thread at I & a pipe at least $\frac{1}{4}$ feet long & $\frac{1}{8}$ of an inch thick outside screwed in. The door must be cast with these letters on & the number of box letters about $\frac{3}{8}$ long & figure $\frac{1}{8}$ or 1 inch.



There must be 2 holes inside to fasten it to a board.

The boxes must be black japanned & the work inside have a thick coat of lacquer although it is not necessary to polish any thing inside.

There must be 2 keys to each lock. Plug must have a hard rubber head on & blocks must be screwed down well so that it will not move with continual putting in of plug.

³
The door of box must be hinged
in this manner



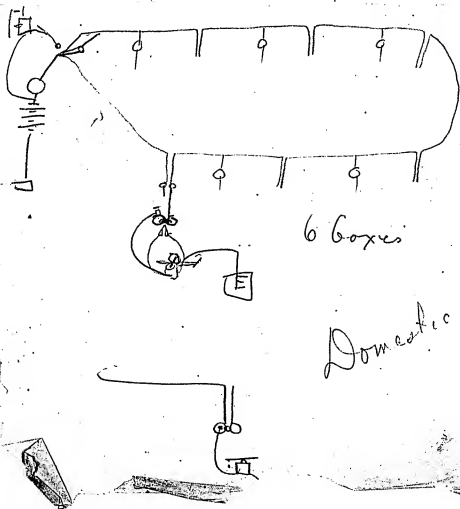
THE ATLANTIC & PACIFIC TELEGRAPH CO.

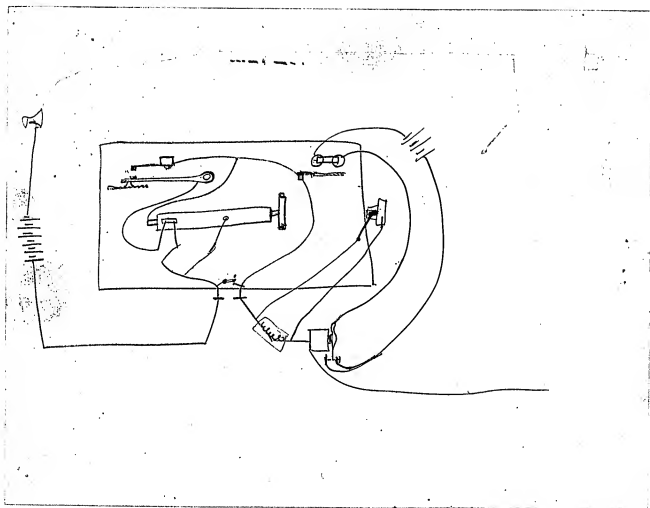
PRESS.

BY TELEGRAPH FROM

Sheet No.

Letter



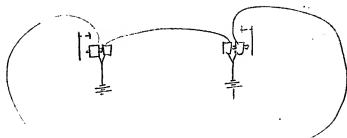
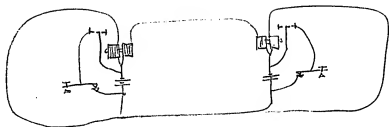


9 Clamps
2 large Clamps

1 Dodge plane	1.85
1 Hammer	.60
1 Jennings Bar	1.00

3.45



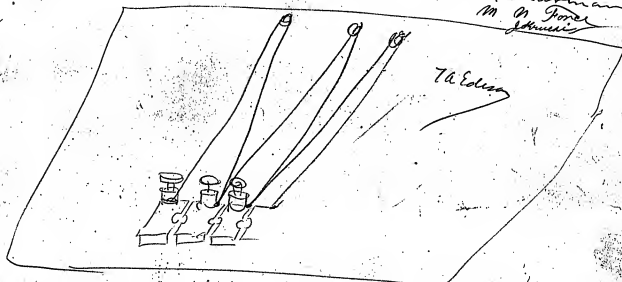


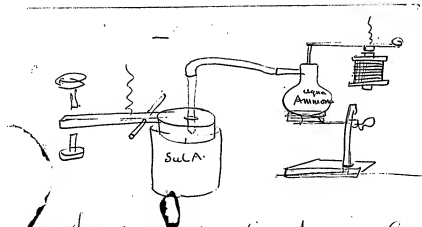
Scrapbook

Wanted Make Resistance for
Equivalent $\frac{1}{4}$ ohm each

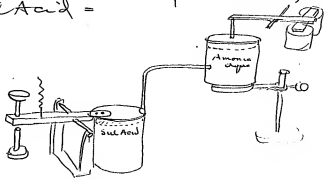
Nov 4

W. B. Butchels
W. E. Carman
M. A. Jones
J. M. Jones

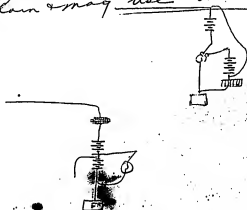




Soluble worked by Ammonia Gas on
Sul Acid =



use sending shunt on
English. P.O. Battery but instead of
Jelam may use a 1500 ohm Relay mag



2000.
2000
1000

4

2000
2000
1000

4

8. . 4

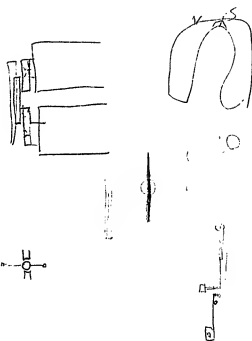
1000.
1000
500

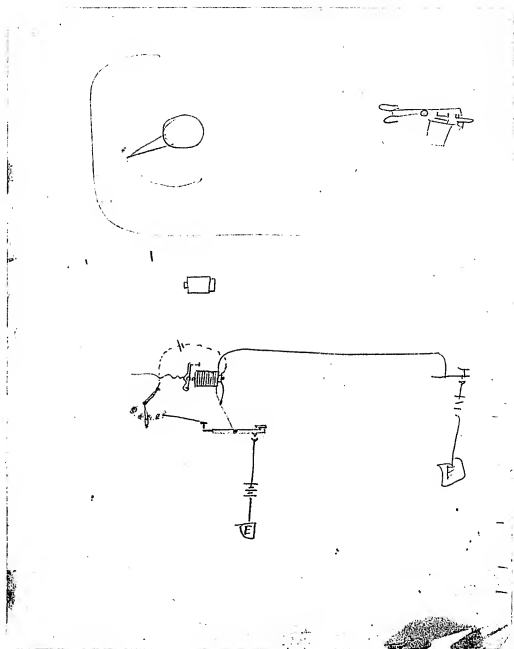
Calcd
5.5al 2 spools 210 each

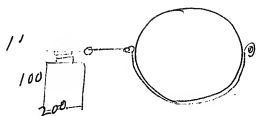
Have GCR order from Bradley
~~two~~ four Relay Spools
two.. 3 inches Long Each 1000 ohms
in 6 inch Long " 1000 ohms.
and 10. 3 inches long exactly 1000 oh.
and 2 3 inch " " 1000 oh

Sip

It is probable that a single cell generates the
wave its electricity in waves following each
other with great rapidity, and that in
consequence of static induction ^{even} upon bodies
at great distance from the cell ~~itself~~ or
even the cell itself the time between the
waves is bridged over by the static charge
although we are unable as yet to isolate
as far from all bodies & determine by
instrumentation the ~~set~~ ^{of the} ~~existence~~ ^{existence} of these waves
an obvious inference ^{of the} ~~can be~~ drawn from
the fact that ^{waves} ~~is~~ ^{transmitted by a telegraph key when} ~~transmitted~~ through
a long conduction close to surrounding bodies
that these waves are continuous when
made rapidly if on the Atlantic Cable
an operator showed key at the rate of
~~fourty~~ ^{forty} ~~four~~ words per minute the
current at the receiving station would
be continuous i.e. after the first word
the ~~instrument~~ ~~lever~~ or ~~galvanometer~~
needle would deflect to a certain







11

100

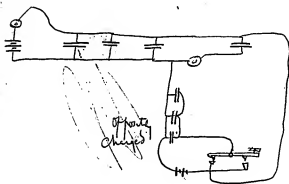
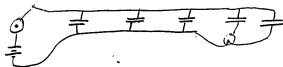
200

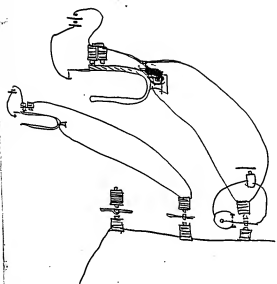
10

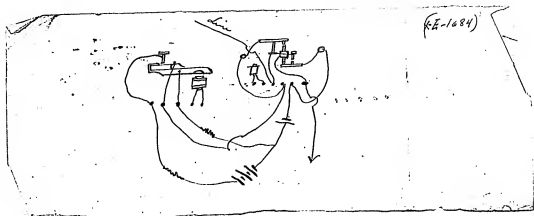
50.

3

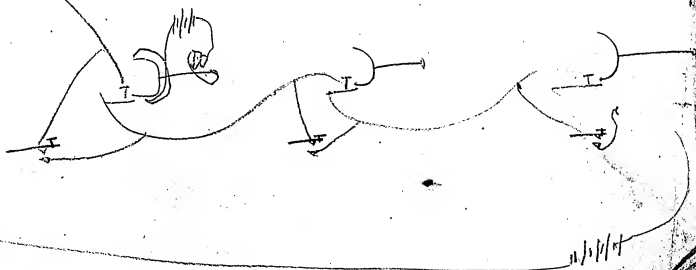
negative

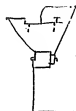
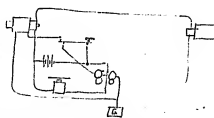
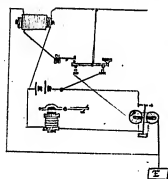


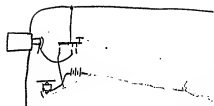
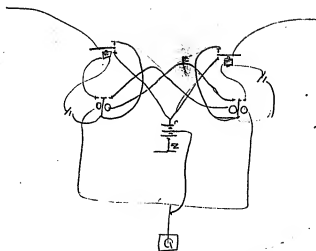




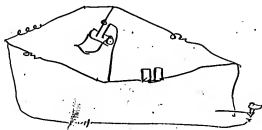
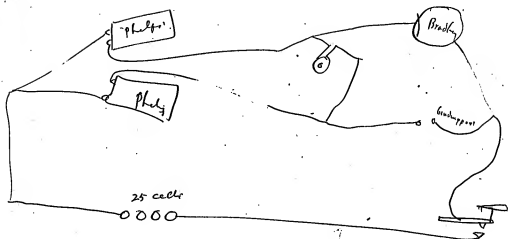
red this Jan 10th ~~1910~~



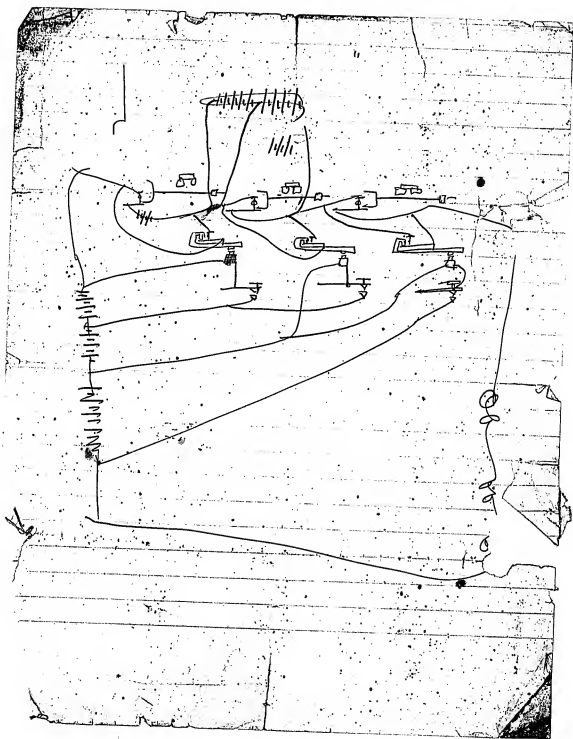




James Adams



Francis B. Moore



Long ss drawings paper feed Caveat
filed March 8. 1871 Dated. Mch 7-71

Scott Caveat feby 17. 71 filed-

Groen Cant April 6 1870
Graces Key & bellraie



graces says 13 levers will be used
that being necessary to form a little
little - his bar.

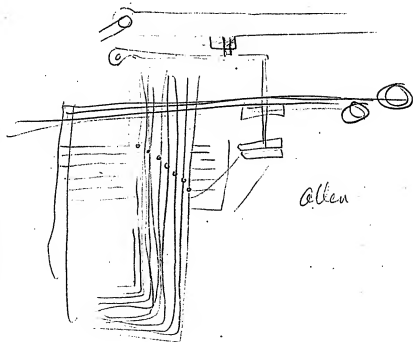
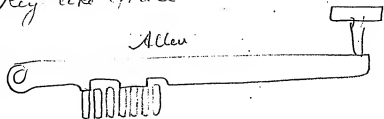


*Drawings and
Discussions*

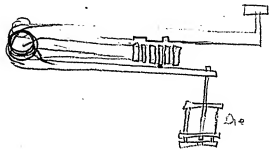
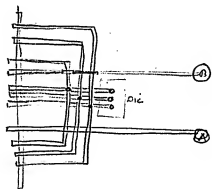
The principle of ~~Collyer's~~ Machine is similar to the Grace machine inasmuch as both have 'movable levers' which are moved by the Key levers to form dies. There are 9 Longitudinal sliding levers which operate the punches ^{worked by 9 keys of the key board}. There are ^{also} 9 Reciprocating levers also worked by the 9 Keys of the Key Board. The Operation of the machine is precisely like the Grace Machine with the Exception that there are no selectors, ~~as~~ one Key is depressed to perforate the letter T & E but two must be depressed to punch letter M, N, O etc, Grace has selectors on ~~the~~ Key levers - Both use adjustable movable dies,

Collyer's

Allen Machine has its Selectors on the
Key like space =



Longitudinal Sliding Bars are in
Whitworth, & practically in Allen.
Thus Allen:



Dated Sept 26,
filed Oct 28

Shows his present Brae
Sub with a power motion

Lon.

Cotton produce not go down.
(Phelps) Reamers & rollers to print

No of lines (this kind), 17.
greatest number on any machine.
28, number of Ramlers
Cotton 12 per unit which allows
for line 1/2 all, all separate batters
worked direct from break wheels.
Total number of instruments 284.
Total line has one instrument but
is going to be increased -
shortest working current outside
this about 10. The battery
is in LV or Battery room.

Small think Manchester
with work from here
works direct break. Wks. same
as the 1st. - No of Ckts 18.
lowest cost 183 Carbon cells in
on Ckt 45.
that circuit ckt 4 cells per unit,
shortest ckt. 43 cells - 7 mts.

Worse no 3

3 wire stock

Stock ckt, No 51,

At Kellogg. 6 ohm, total
806. No cells 80 Carbon cells.

2 motor batteries

No of worse lines 12,

all from about 60 volts,

all 3 wire stocks with
with up & down strokes,
since stocks then is
mainly an ampere
each print, which
when printing & type
are closed at once is 2
ampere.

Motor battery big Phelps

1/2 ohm internal, Bureau
have generally 2 cells,
each,

have 1/2 doz ordinary 2 cell
Locals no Manchester Phelps.

one big bat in Cotton 1 m
Ch produced 1 m ny pr.
down det Brand.

Manchester has 2 or 3
Locals of 20 cells each
Carbon -

Reserve of Phelps 30 ohm 12 cells,
Manchester 13 ohm 5 cells.
all magnets in one ckt,

following is no cells in Phelps

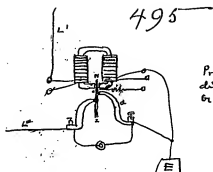
Each ckt.	Ckts	Ohms	Volts
1	99	12	12
2	118	12	12
3	126	12	12
4	147	12	12
5	149	12	12
6	105	12	12
7	78	12	12
8	43	12	12
Amperes			
1	141	12	12
2	149	12	12
3	149	12	12
4	149	12	12
5	149	12	12
6	149	12	12
7	149	12	12
8	149	12	12
9	149	12	12
10	149	12	12

(35)
Manhattan & Phelps
not like Scott. a

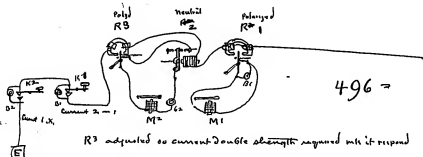


Phelps shot old -
new wing but
was in Cailin with
stopper - Manhattan
dont shot ch -

Bosscha



836
Percott says: 1st pp. something
diff from what the app. appears to
be it appears to be a transmittal



R^3 adjusted so current double strength required with it respond
Both keys closed sends Neg current 1. No 1 key Current 2. negative
No 2 key Current 1 positive

done
Key 1. closes off Relays, but M^1 only responds

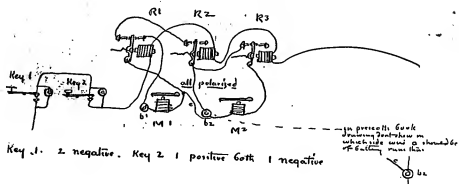
Key 2 alone sends positive current 1. R^2 closes, M^2 closes. this current
don't effect other relays

Both keys closed, current neg strength 1. this operates R^1 & R^3 both M^1 & M^2
closes

Percott says: this output defective Co's two currents entire pass for neutral relay unstable.

Boscha

afterward Boscha mounted 497, to do away with defect this morning —

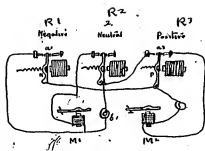


Key 1. 2 negative. Key 2 1 positive both 1 negative

Key 1. Causes R¹ R² close + close M¹. 2nd Key Causes R² alone respond both R¹ + R² being opp polarity; hence M² alone effected; both keys closed Causes R² alone respond when wire from M¹ M² short for b₁ away that side b₂

Revised to C
1960
1862

Bremer

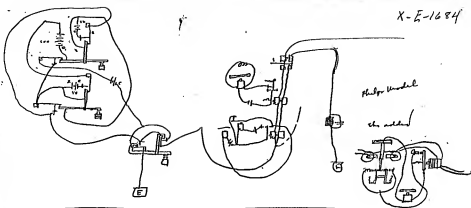


open: no current = all open M^0 M^2 open, formed by short ckt battery

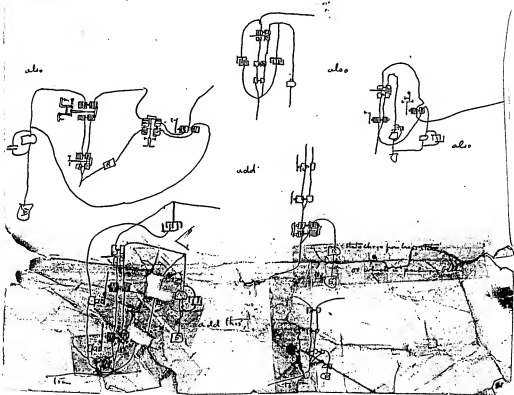
1. Key closed, negative current strength 1. sent R^1 responds; shunt removed. M^1 closed =

2nd Key closed. P current sent strength 2. R^2 & R^3 close
 M^2 closes.

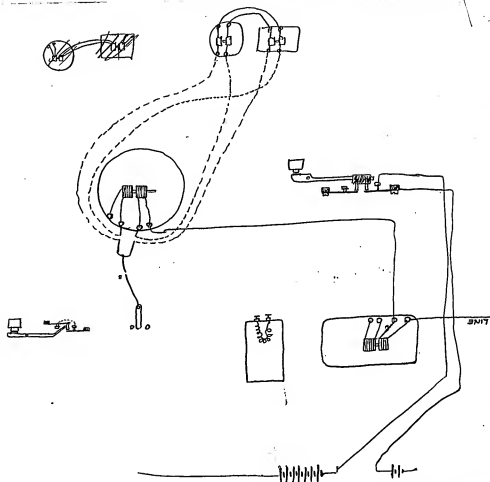
Both closed P current strength 1. causes R^3 only close. that
 closes both M^2 & M^1 formed directly latter by
 removed short circuit =

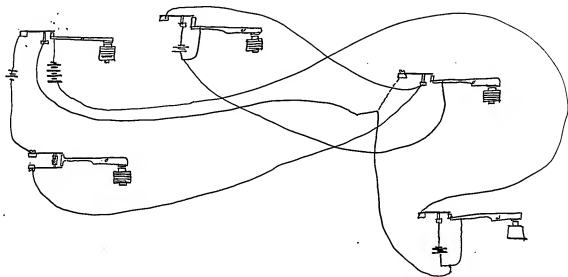


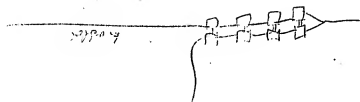
an above description part in this.



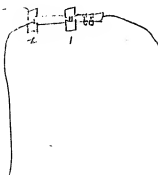
X-7-1084







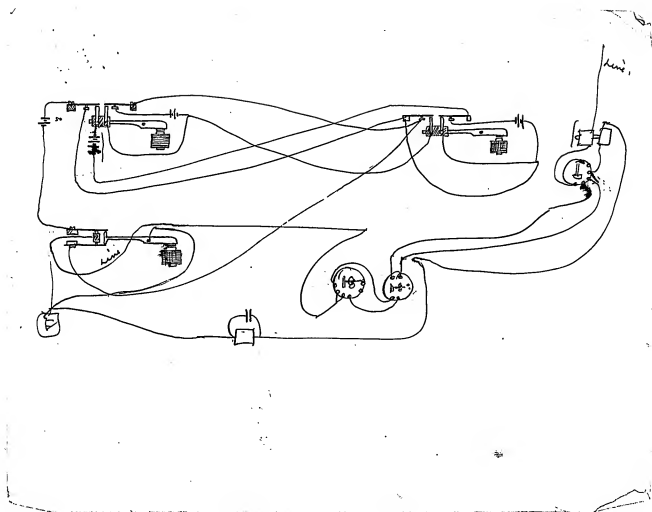
h. 0.0.0.0

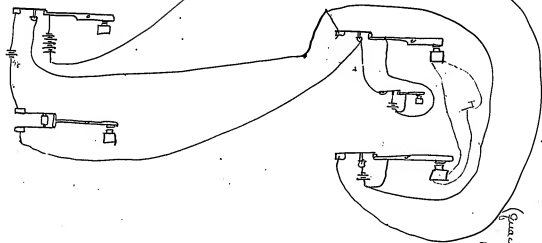


7

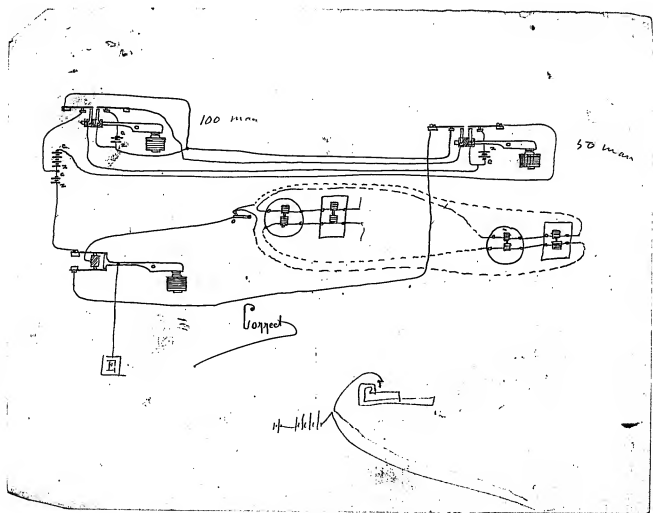
1

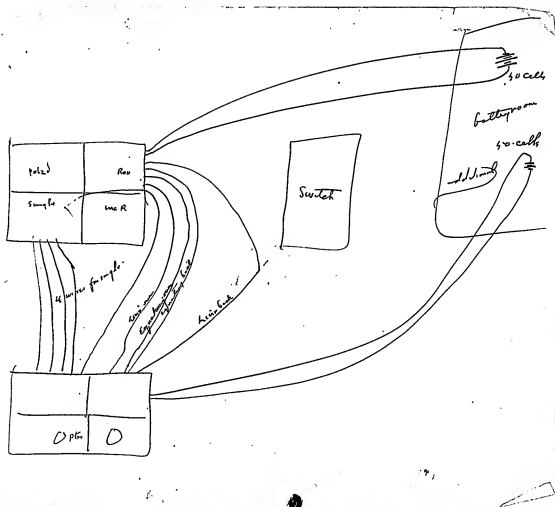
X-E-1284



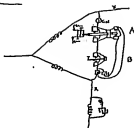
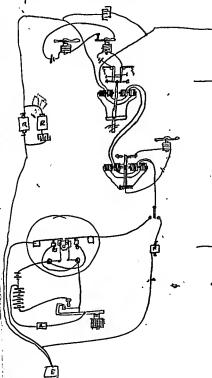


Quadrant
1317
X-F. 1254

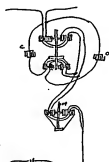




German Anemograph

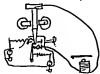
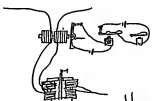


Went to A. says he is looking for a small difficulty
by getting X & Y. to pass through it. Double cells.



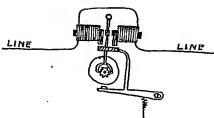
Do Considerable describing
this diagram with
diagram.

Went to repeat
generating low
level.

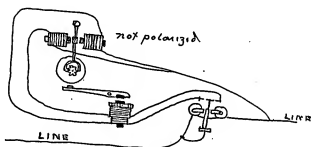


if can get more in detail more

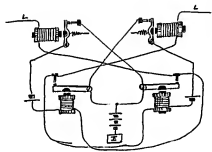




Smith No. 3.
Reversed Currents. No electro magnet. for printing



Smith No. 4—
Reversed Currents.



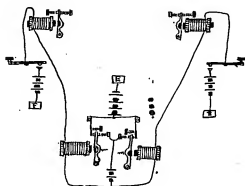
~~Cont~~

Willif work

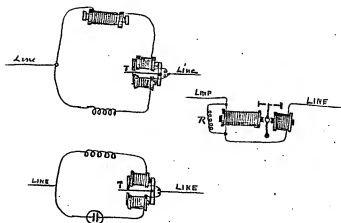
Speeds Repeat

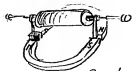
Chapter 495

Hirshens Morse system with repeater.



Relays worked by magnet induction.





guess it only

Brequet polarized Rly
Dial 383

get Tammern Duplex



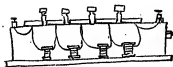
Helps Multiplex
Circuit breaker

Replaced by clockwork.



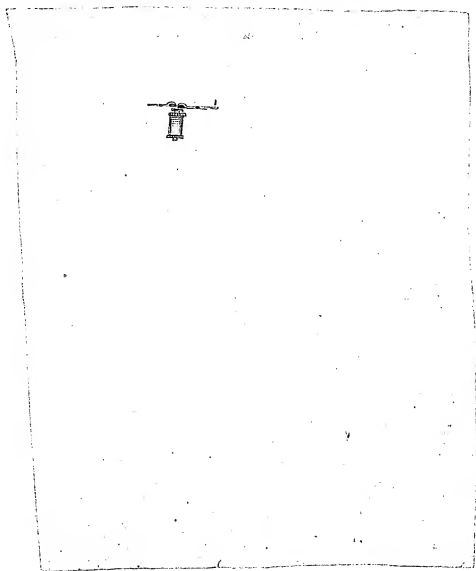


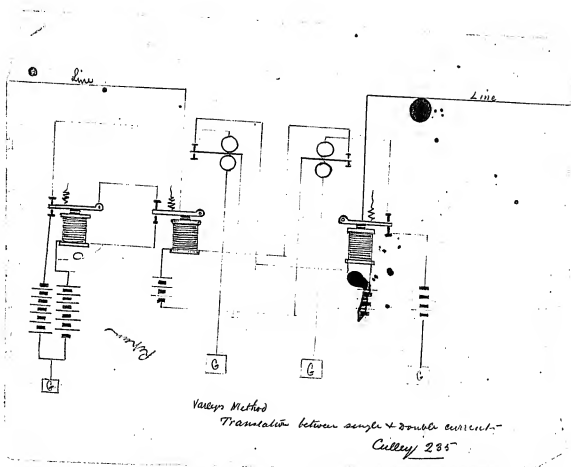
Jacobi's Rheo,



Siemens Rheostat







Simple Morse Circuit European.

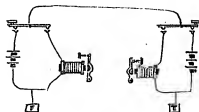
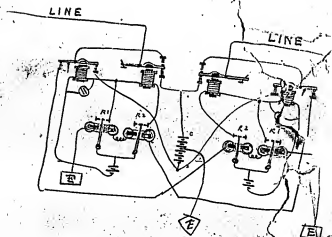


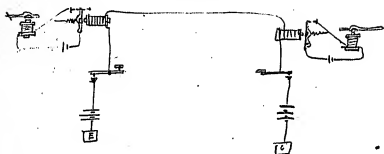
Figure 85-



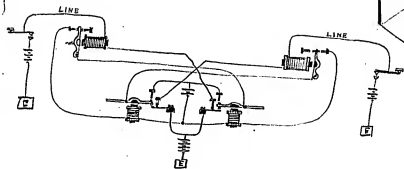
Varley's Double-current Repeater

Sabin 149

Frischman plan for
Work closed circuits

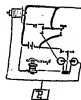


Frischen Morse-system with
Repeater



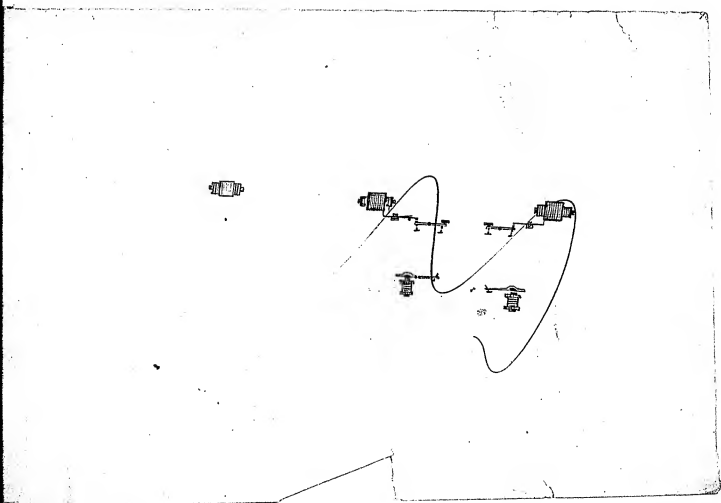
Sabini, page 151.

Siemens system
Working by induction Current

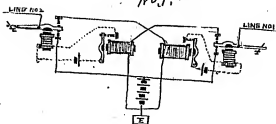


Same here

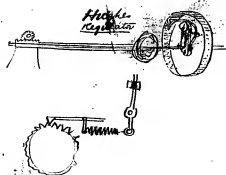
Diagram 135-



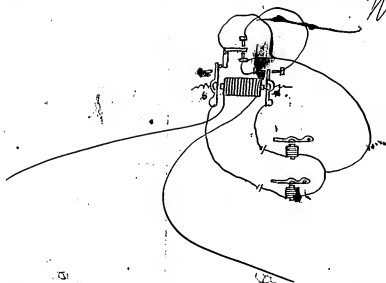
English Translation
No. 1.



Regulators and Synchronizers



Helps regulate the Electromotor by means
face wheel running in air with screw turning
in same.



McKelron

Light & heavy

1 Key . P. 1 Key N

both Key and strong P & N
which ever it is

Ja Edna

Wha Patchen

Caveat.
Repeating from
Ink marks - not
preserved

The object of this invention is to transmit or ordinary handwriting over telegraphic wires from manuscript written in ordinary or special ink, and recording the same on chemically prepared paper.

The invention consists in arranging a number of levers the ends of which are provided with fine smooth points over a drum carrying a ^{continuous} strip of ordinary writing paper, and so arranging these lever that they bear with considerable down upon the smooth paper but not sufficiently to obtain enough friction to ~~overcome the~~ to carry them in the direction in which the drum revolves or overcome the reschable force of a spiral spring which tends to give the lever a motion contrary to the

2, ink -
direction which the drum revolves
and the action of which spring
tends to keep said levers against
a fixed point when no writing
is passing under them.

Immediately Opposite these
levers are contact points, all connected
to the same pole of the transmitting
battery, and arranged in such a
manner that should the friction
of the paper be increased in any
manner ~~it would be sufficient~~
to overcome the retractor power
of the spring & that the lever
would be carried forward by the
revolving drum and come in
contact with this circuit closing
point. The ink supplies this
extra friction, when the clear
paper is passing under the point
connected to the lever the friction
as stated before is insufficient
to carry the lever forward, but
when an ink mark comes in

3 ink

Contact with this point the friction is at once so increased that the point is locked to the paper to go to speak and carried forward to the front point closing the circuit ^{for enough} a length of time as is proportional to the length of the ink mark. It is not necessary that the ink mark should be in relief or that it should be of great depth, but the mere ink stain on the paper is sufficient to greatly change the smoothness of its surface and produce this friction extra friction. If a special ink is used it can be made to increase the friction or decrease it the latter effect being obtained by putting an acid in it.

Figure 1 shows one single lever operated by the ink marks, Zip

view

4 wk

Fig 1

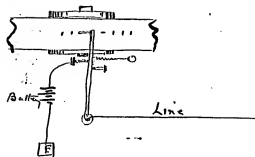
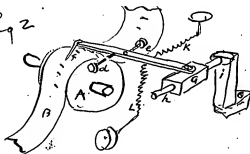


Figure 2 shows it in perspective.

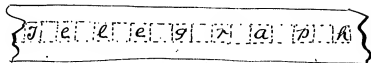
fig 2



A is the continuously revolving drum
 B is the paper with ink marks upon it,
 C is the moveable lever provided
 with the sharp point F. held
 tightly in contact with the paper

6 ink

fig 3



The dotted lines are light tracing used for the purpose of ~~separating~~^{separating} the letters from each by intervals of space so that they may be transmitted with four wires.
Figure 4 shows the arrangement

Scrap Book

Roman letter printer

No magnet or armature ^{or coiled wire is used} ~~is used~~

This apparatus is based upon the fact discovered by Mr Edison ^{by experiment} ~~that~~ that electricity may be converted ^{into the equivalent of} ~~into~~ mechanical motion by electrochemical decomposition.

The apparatus consists of a lever provided with a point, resting upon a strip of paper moistened in a chemical solution.

This paper is moved ^{The normal friction of the paper causes the lever to the left} slowly by clockwork, with a current passing ^{the} ~~the~~ line.

It passes ^{it} ~~the~~ through the lead point and paper to the earth, and in its passage ^{of the paper} ~~through the paper~~

converts that paper portion immediately under the point by a peculiar chemical reaction into another chemical compound substance of a more which

acts as a lubricant, and the lever quickly moved to the right by a retractile spring.

Roman Letter Chemical Telegraph Circuit

The object of this Invention is to transmit & receive & record Roman Letters the first of which is done by Roman letters perforated in strips of paper of which a patent has already been applied and the latter Recording on Chemically prepared paper by electric decomposition. The letters so perforated. Several methods have been already described in a previous Patent whereby this may be accomplished on two or more wires.

The present invention consists of mechanical devices as well as electrical devices for operating it upon one wire.

The main feature of which is to send half of the Roman letter over the wire from the perforated paper with Positive & negative currents. One per. both of the transmitters & receiver being set one line of perforation (forming a letter) ahead of the other, and by a director, commutator or current changer connected with

The Receiving instrument² throw the line
over on another set of recording pens
record the balance of the letter.
The Circuit Changer is controlled
by a sensitive Electro-magnet provided
with a lever which holds &
releases an escape wheel at
the beginning of every letter.
Each letter of the perforated paper
is formed of small holes; at
the commencement of each letter
& right below it is a large
perforation which has a separate
contact roller by itself & when
no other roller is through a
small hole passes through
the large hole & puts a strong
current of three times the duration
of the current transmitted from
the perforation forming the letter
this wave actuates the magnet
of the distant station for an
instant when it lever is
drawn away from the escape
wheel allowing the circuit
changer to revolve one or both

3

This Circuit Changer in revolving
one tooth first connects the
Line & Earth wire first to two
recording pens (the last ones)
when this has formed half of
the letter the Circuit Changer
which is still revolving "forward"
disconnects the line & Earth
from the back pens & throws
it on the first two pens until
the other half of the letter
is formed at this moment the
circuit changer is arrested by
the lever of the electromagnet
coming in contact with one
of the teeth of the stop-
wheel, it now lays still till
another large hole before a
letter passes under the extra
roller pen at the branching
station when another wave
is sent & another letter is
printed, This by sending
an extra wave before each

41

Letter to regulate the recording mechanism & change from one letter to another perfect synchronism is unnecessary & the whole time of the wire is utilized to make the letter, or in other words positive followed immediately by a negative form half of the letter & immediately the wire is thrown over on a new set of recording pens where the same action takes place. This keeps the wire constantly at work. The peculiar manner in which the letter must be formed gives its own spacing without ceasing. Landing currents over the wire to give a space as is usual, figure One 1 shows the arrangement of the Contact rollers of the Recording Station.

fig 1

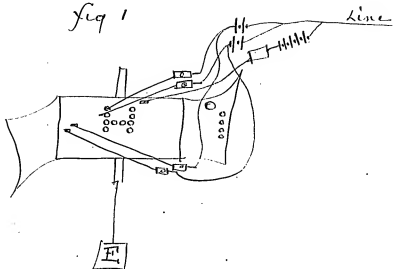
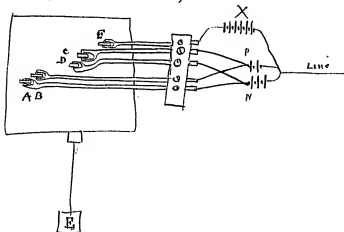


fig 2



In forming a letter first E comes in
 Contact with the Drum through the
 large hole putting large battery
 X to Line & Earth & sending

6

a strong current over the line which
actuating the Electro-magnet
sets the circuit changer in
motion. (when the circuit changer is
reverted the line is not in connection
with either set of pens) as the
letter passes along the top passes under
C sending a P to him then D,
sending a N to him. & so until
till the whole of the letter has
passed under C & D, the
lower portion of the letter now
comes in contact with A & B,
which act precisely as C & D.
after the letter has passed under
both by that time the circuit
changer at the distant end
is reverted, Another large hole
passes under E setting the
changer at the distant end
going & another letter is
received. The perforated
letters are separated from
each other the distance of
the room taken up by the

Largest letter of the alphabet -
and a little more. The Extra
space required for the large
hole. I do not wish to confine
myself to regulating the distant
current changer at every letter
as the large hole may be used
only between words, providing
the transmitting & receiving
run nearly synchronously.
Neither do I wish to confine my
self to changing the ~~current~~
line wire from one set of pens
to the other set by electrically
as the pens instead of having
the line disconnected from them
may be lifted off the paper.
(c) when one set is doing
work the other set is lifted
off the paper & vice versa.
The lifting may be controlled
by an ~~electric~~ magnet
actuated by wave sent

from the distant ⁸ & Beaumont
Station neither do I wish to
confine myself to using a subset
of pens as one pen may be used
which may be shifted sideways
four or more times ~~the~~ the top part
- of any letter being transmitted
first then the pen shifted by
the mechanism of the receiving
machine & the next portion of the
letter sent & recorded then the
third & last the fourth when
the receiving pen is replaced
by the mechanism in its original
position ready to mark the next
letter the time of starting to
mark being controlled by the
magnet = figure 3. shows
The recording instrument,

5

a solution of ~~compared of the following~~
~~ingredient~~ a saturated solution of
Sulphuret of potash to which is added
when sensitization is required a slight
amount of Hydrochloric Acid =
A saturated solution of Nitrate of
Manganese - or a saturated solution
of Potassate of potash to which is added
an equal amount of Nitrate of Ammonia
acid & the whole diluted with water -

I do not wish to confine my to recording
with ink and having the ink absorb the
metallic filings as the paper may be
Embossed indented and the by an ordinary
Morse Register and the indentations passing
through the filing box be filled with
the metal & ~~unintentionally~~ ^{thereby} passed
between the roller and forced into the
gap & at the same time smoothing
down the indentations and leaving
a smooth metallic surface =

Neither do I wish to confine myself to
any particular mode of hammering
these metallic characters as two contact
springs close together are connected

6

to one end of the line and one to the other and in passing over the metallic character the circuit would be closed through it, or the metallic character might be forced through the paper so as to be on both sides and a contact spring rubbing on one side and connected to the line and the metallic drum underneath on which the paper runs might be connected to the other end of the line and the connection made through the paper - I will mention here that the metallic character may be

I claim - preparing telegraphic paper for automatic transmitting by recording by ink or indentations and substantially as described and metalizing the characters by forcing it ^{into} the paper.

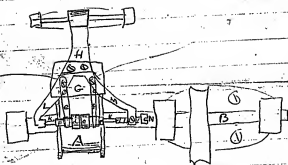
2 The rolls --- for the purpose set forth =

3 The combination of the forcing or metalizing rolls or their equivalents with the recording machine for and metallic dust,

⁴ The transmitting rollers or equivalents ^{as a device described} to transmitting from paper having metalized characters

5-

The chemical solutions substantially as
set forth -



Caueat, on The Automatic System -
Transmitting &
Receiving Instrument,

The object of this invention is
~~Construct on devices for transmitting~~ from
The perforated paper and receiving the
the Chemically prepared paper,
Expeditionely & accurately,

The invention consists in the
several devices to accomplish
that end as well as the arrangement of
Contact points & electric Connections.

figure 1 Shows one side
of the machine which is
the receiving part.

The object of this invention is to transmit and receive ~~upon Roman characters~~ ^{on} ~~perforated paper~~ ^{on} or ~~types~~ ^{on} electric waves ~~of~~ over telegraphic circuits to form Roman letters at the distant station, by means of a chemical recording instrument,

The invention consists in

First ~~method~~ in the manner of grouping the various perforations on the transmitting slip and the arrangement of the battery and contact points or rollers,

Second in the arrangement at the receiving station of the recording points, compensating device, and Electro Sallari, connector for connecting ~~the~~ ^{any} modulation of the ~~signal~~ ^{letter} which takes place, also in a device for the prevention of false marks,

In figure ~~one~~ ^{one} is shown a method

set the mark we will get a
very sensible paper.

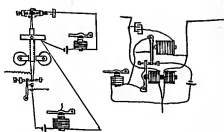
The Havenswell punk
president. Getting this through
he has it under way &
I have Model under way.
Case have Murray state
Model over to him —

Get District Affairs from
H.C. & air sounder etc,

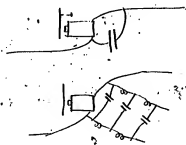
for sending Shunt, we
ought to write,

Lets go to work on record
by connecting station
to Ring of Ballon & using
Logwood & I believe will be
we got ~~the~~ a simple mark
which instantly fades &
is more sensible than
Pole de Pot of American

To be put in Patented



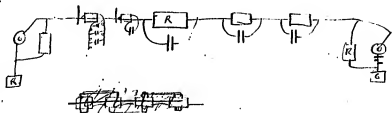
Model.



Sign English Pat

See Mann.

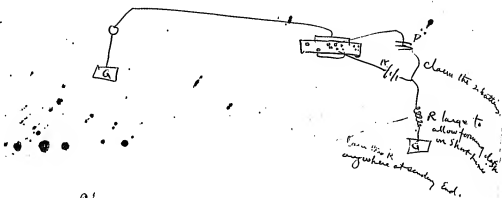
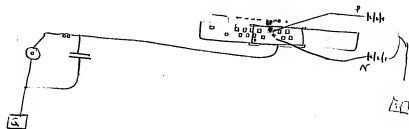
See Hermann Instrument
if got all Eng. Patents
Go with M to Keeser



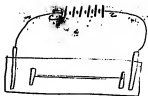
~~Q C C C C C C~~



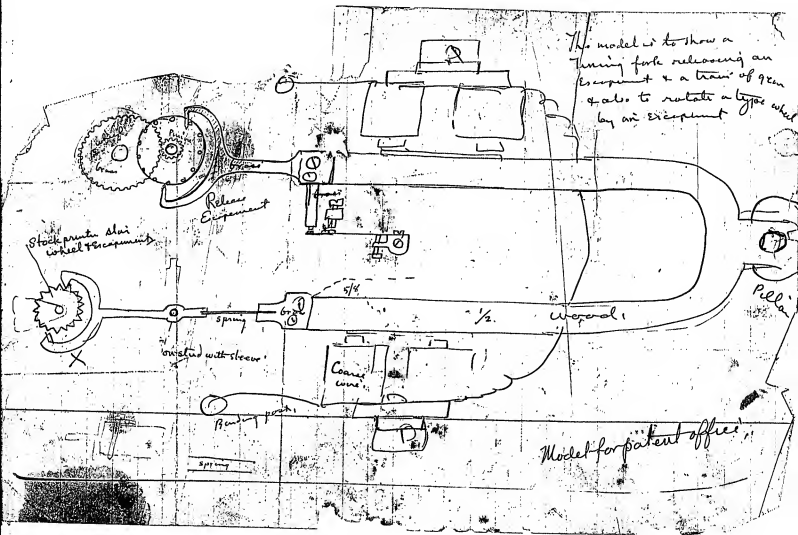
model submit to general



Claim the Combination of a Wheatstone
Transmitting ~~and~~ perforated paper with
chemically prepared paper
for recording the reversed current,



J. A. Edwards
pioneer papers
and drawings



Tried shunting line before it came
 to the forks with shunt to earth,
 with polarized relays & reversed
 currents - found that it ~~didn't~~
 worked all four. OK on Phil &
 return but we did not attempt
 to transmit from the receiving
 station as the relay at Hanswelly
 end showed great return charge
 found that Magnets were locked
 in the shunt to earth at both
 ends did not appear to improve
 the working had about 6 to
 800 plain in each = we tried
 the 1600 ohm old Dup Relay
 at Reg end & a 130 Ohm Well
 relay at Hanswelly End
 We are now trying with 90
 Cells Carbon 60 small & 30-1½
 butting Carbon 130 ohm W.N. Relay

With 3 ending condensers at one
 end & 1 at other put it on
 3000 ohm didn't work very well
 perhaps max at well adjusted on reeds -
 put Albany on (12) Menlo to Albany -
 return found trouble on wire
 Either from cross fire ~~loop~~ induction
 or a dead cross

Find that the Condensers don't
 appear to discharge quick enough
 and a portion goes over into
 the next instrument which
 the Condenser is also retarded by
 the addition of the line charge
 hence it looks like of failure
 but perhaps a reverse current
 sent into the wire through
 the fork Earth wires or perhaps
 the insertion of a Condenser

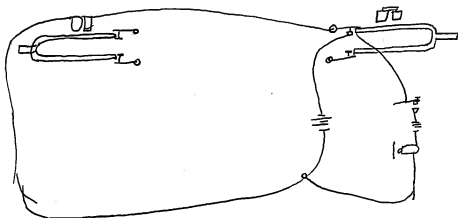
will prevent this,

I think short sharp reverse currents from a battery is the most likely to work.

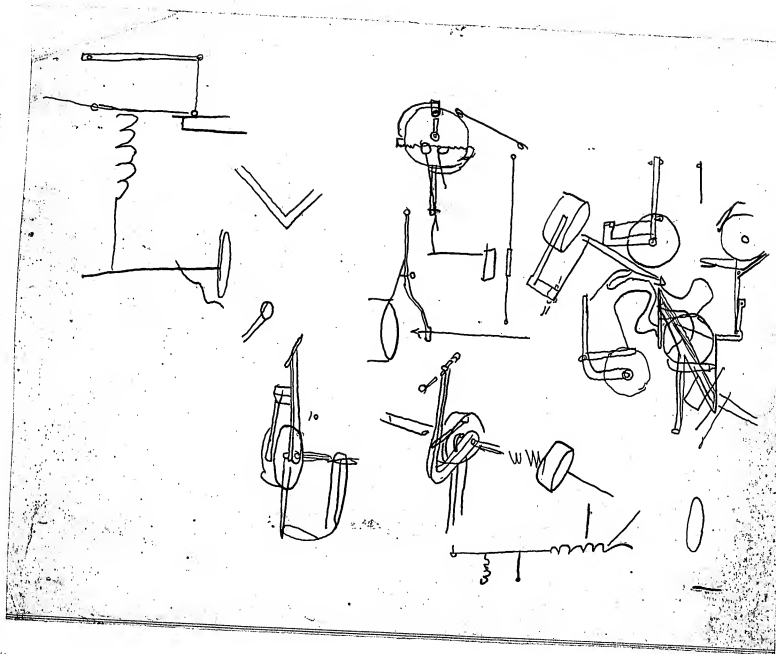
Tried putting in smaller reverse battery in fork earth wire P to line on one end Z on other didn't do much of any good. Tried both with same poles to line tho appeared to weaken Condenser currents so could not signal

ceased Condenser and then could signal but waves were carried over to other instrument, took batteries out of fork ground wire and inserted Condenser in each. The idea being that Condenser would receive charge ~~take~~ from line & put out in opposite direction to rest instrument or neutralize next

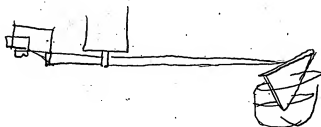
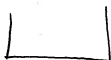
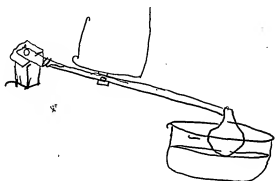
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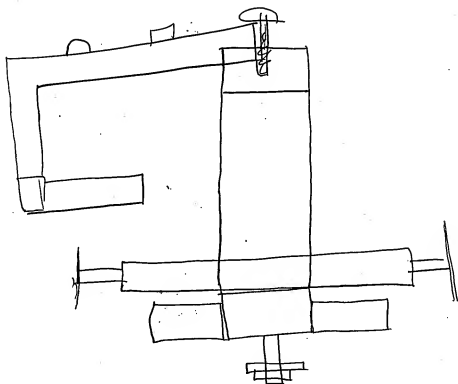
[TRACING]



[TRACING]



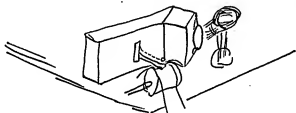
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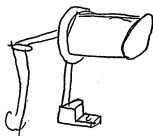
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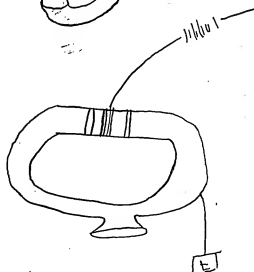
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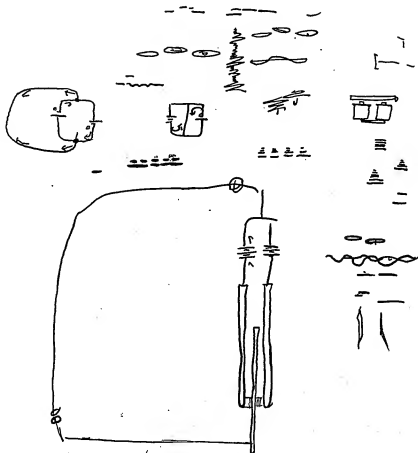
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Adams

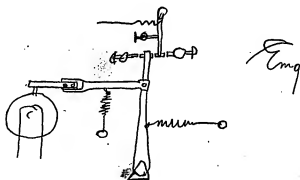
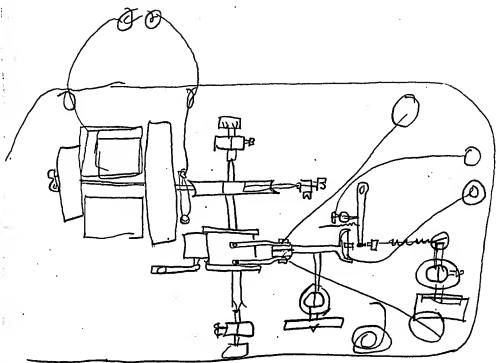


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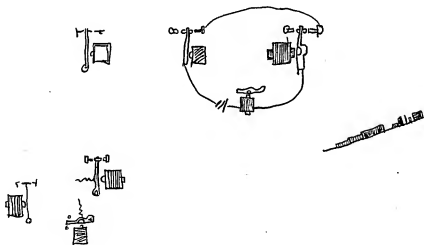
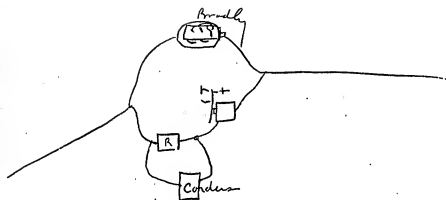


James Adams

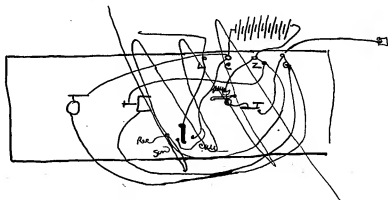
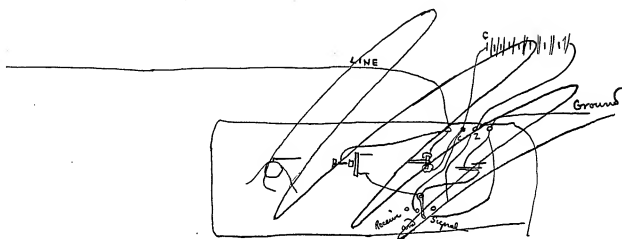
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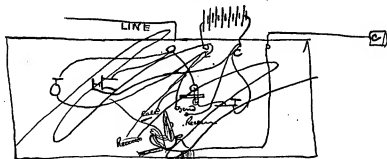
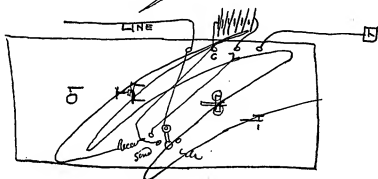
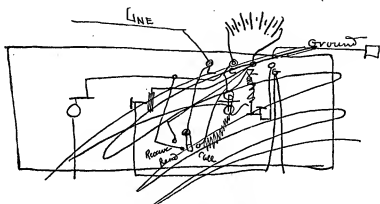
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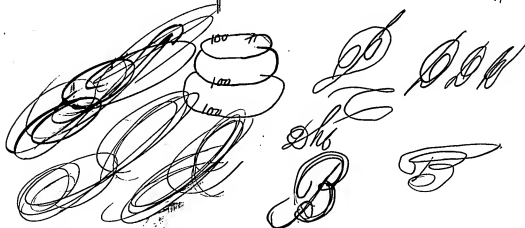
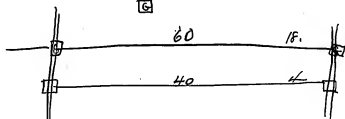
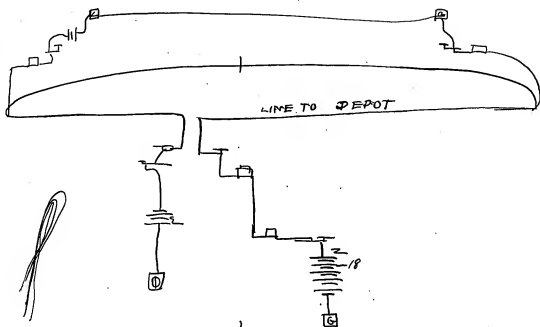
[TRACING]



[TRACING]



[TRACING]



Undated. Telephone (NS-Undated-006)

Enclosed
Drawing of Press ~~is~~
is full size and can be made
without any description

The enclosed drawing is the
Plan and elevation of the mould
for making the Carbon button.
It is split and has two handles
to open it with. After closing it up
it is held together by two studs
in order to take the strain off the
handles, the drawings are full
size and the following is a de-
scription of ~~the~~ the mould:-

It is a cast iron plate into which
is screwed a steel stud B this
stud acts as a hinge for two
steel jaws C which open and
close by the handles H H

Also in the cast iron plate
is recessed a steel piece C which
has a shank projecting half
way through the hinged jaws

The steel jaws ² are held together
by studs E & F keyed on one side
by others I & J these take the
strain of the hinge when the
pressure is on the ~~press~~ button
D is the plunger which is made
so long that when it is squeezed
down & the dies it will leave
.08 of an inch between itself and
the end of Shank of C ~~mould~~ ^{and} ~~in making the carbon button~~
~~as you will have no trouble in getting button out of~~
~~any particularly~~ Call your attention
to the following:-

- 1 The hinge must be perfect and
without any shake whatever
- 2 The hinged dies must be
hardened or else the powder,
after a while will make a recess
in the steel and it will be difficult
to bring them out whole
- 3 The Shank C and the plunger
D must be fitted exactly,
hardened, ground, the faces

3
Made perfectly flat, highly
furnished

4 The hole must be exactly .69 of an
inch and ground out true and
highly furnished, both ends of
the hole can be rounded out
a little

5 When the jaws shut together
there must be a perfect fit
or some carbon will be squeezed
into the ~~cracks~~ space

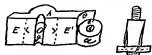
6 The button must be made in
the middle of the mould as
in sketch

7 310 milligrammes of carbon must
be used at each time and the
plunger pressed down until
the head of it beds on the jaws
then the button will be (if you
moulds is made according to
drawing) .69 diameter and .08
in thickness


8 It is very essential that the

dies shall open and close without
disturbing the shank & therefore
be carefully to get that a perfect
fit on them.

*Principal Operations
on Carbon mould.*



- I. Place casting on both sides.
- II. " forging to the line allows except at a where 0.01 should be left outside the line for turning on mandrel.
- III. clamps down against face plate to bore out hole for ingested & ^{then} offset C & C'
- IV. Turn C on mandrel by pulling belt by hand.
- V. Fit Stud & put together to fill & scrape faces of recess a trifle at E & E'
- VI. Place cast iron plate on face plate to turn out recess for shoulders of Stud F & bore & thread hole for same (fine thread because there are but few)

VII. Put all together & clamp on
face plate.  A bare centre hole
& run drill into cast iron a
little ways, grind & lay
the hole & take shows off
without moving cast iron plate.

VIII. Turn out recess in plate
for bottom plug.

IX. Take shows on mandrill & face
off at Top & bottom.

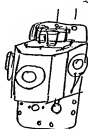
X. Lay centre hole to a high polish
& fit plugs after they are hardened
& finish them on face to a dead polish.

J.H.

May 27th 5.30 a.m.

Musi

I want to make a telephone like
Phelps arrangement, that is a bracket
box



like this so that I want
you to look over these sketches
and have Andrews start to
make a walnut box if you
have wood; if not make it of
pine and I will go and

get him as soon as I get up: but you get
him started first thing. Edison wants this
bad but I do not want to bother you with
it until I get the shape of box I want

Batchelor

J. Batchelor

Tel. phone in U.S. Sketched

Outside 19/6 Diagram

Carbon Pressure.

W

Fig 1

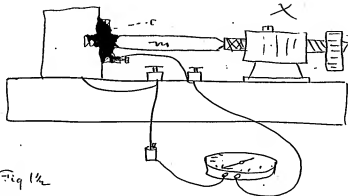


Fig 1 1/2

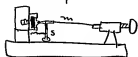
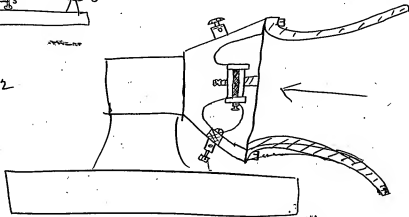
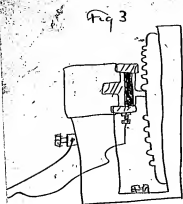


Fig 2



Witnessed and attested before me this
18th day of March, A.D. 1900,
Chas. Fletcher, John Kewell, and Martin Kewell,
and acknowledged the above to be their signatures.

Witnesses



aneroid

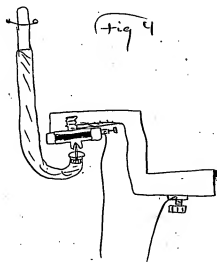
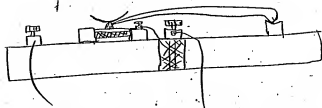
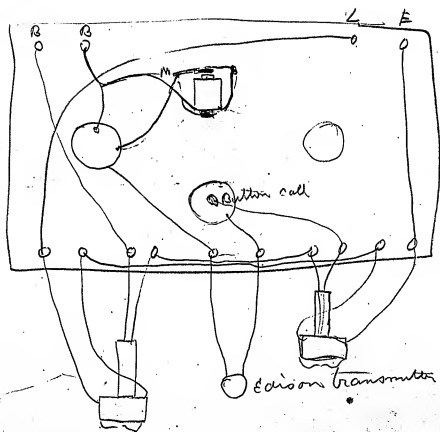
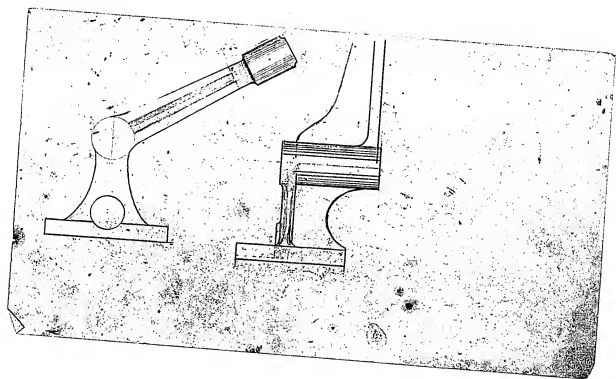


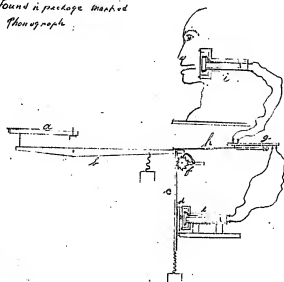
Fig 5







Found in package marked
Phonograph.



PATENT SERIES, 1871-1878

The Edison National Historic Site holds a wide variety of patent-related documents. In addition to a complete set of the United States patents of Thomas A. Edison, there is also an extensive series of patent applications filed by Edison and his associates, and a smaller collection of patent caveats (descriptions of proposed inventions that were often filed prior to the formal patent application). Other patent-related materials at ENHS include correspondence, bills, and receipts from Edison's patent attorneys; correspondence from the U.S. Patent Office and from Edison's business associates; patents assignments; and records of patent interferences (similar in many respects to civil court litigation).

The Patent Series, 1871-1878, consists primarily of patent applications and caveats. There are only a few such documents at ENHS for the 1870s. These include certified copies of seven abandoned applications relating to improvements in duplex telegraphy, two notebooks containing copies of Edison caveats, and a small number of tracings and other patent drawings.

Patent-related materials for the 1870s can also be found in most of the other series on the microfilm. Telegraph- and telephone-related applications and caveats frequently appear as exhibits in the civil court records and the patent interference cases in the Litigation Series. Several of the volumes in the Notebook Series and the Letterbook Series contain drafts of applications and caveats, while notes that were made preparatory to the filing of patent applications can frequently be found among the unbound notes and drawings in the Notebook Series.

The various "Patents" folders in the Document File contain patent-related correspondence, as well as a few unbound applications and caveats. Preliminary statements, correspondence, and memoranda regarding patent interference cases, along with patent assignments, agreements, and a few issued patents from foreign countries, can also be found in these folders.

A set of seven bound volumes containing testimony, exhibits, and arguments involving patent rights to the telephone (the "Telephone Interferences") has been filmed as part of the Litigation Series. A complete set of the 1,093 patents issued to Thomas A. Edison has been filmed as a separate series in the microfilm edition. A nearly complete set of application files for Edison's issued patents, along with an extensive collection of his caveats, can be found at the National Archives in Record Group 241, Records of the Patent Office.

The documents and finding aids in the Patent Series, 1871-1878, have been filmed in the following order:

Patent Applications

1. Lists of Patent Applications by Case Numbers (1871-1877)
2. Abstracts of Edison's Abandoned Applications (1876-1885)
3. Copies of Abandoned Applications (1873)
4. Patent Application Drawings (1876-1878)

Caveats

1. List of Caveats (1870-1875)
2. Tissue Copy Book (1874-1876)
3. Unbound Notebook (1874)
4. Caveat Drawings (1876-1878)

PATENT APPLICATIONS

The Edison National Historic Site holds an extensive set of successful and unsuccessful American and foreign patent applications. Most of these applications, and related materials, are from the files of Edison's patent attorneys and date from the 1880s and later. For the earlier period, there are certified copies of seven abandoned patent applications, originally filed in 1873, as well as a collection of tracings and other patent application drawings.

Lists of Patent Applications by Case Numbers

The following two lists provide a partial inventory of Edison's telegraph-related patent applications for the years 1871-1877. The lists include case numbers 31-148 and ten additional applications. The case numbers were assigned to the applications by Edison and his attorneys before they were sent to the Patent Office.

The first list, covering case numbers 31-120 and ten unnumbered items, appears as Defendants' Exhibit No. 40 in the printed record of Atlantic and Pacific Telegraph Company v. George B. Prescott, Western Union Telegraph Company, Lemuel W. Serrell, and Thomas A. Edison -- the so-called Quadruplex Case. (See Litigation Series.) This list gives dates of issue and patent numbers for the successful applications, along with the names of the individuals or companies to whom the applications were assigned.

The second list, covering case numbers 103-148, is printed on page 108 in the volume of testimony for Edison in the Telephone Interferences, Cases A through L and No. 1. (See Litigation Series.)

Defendant's Exhibit No. 40—May 17, 1877.

July 4, 1871...	114,666, Telegraph Transmuting Inst.		
July 24, 1871...	111,113, Governor for meters.....	Andrews, Fields & Laffeta.	
July 4, 1871...	114,867, Relay for Telegraphs.....	M. Laffeta.	
July 4, 1871...	115,661, Performer for paper.....	do.	
July 2, 1872...	112,684, Telegraph apparatus.....	do.	
July 22, "	114,666, Ink recording apparatus.....	do.	
July 16, "	112,641, Printing machines.....	do.	
July 12, "	112,648, Performer.....	do.	
July 12, "	112,648, Chemical paper.....	do.	
July 12, "	112,619, Printing machines.....	do.	81
July 2, 1872...	112,606, Printing Telegraph.....	Gold & S. Tol. Co.	33
June 16, "	112,111, Magnetic Telegraph.....	do.	33
July 2, 1872...	112,601, Printing Telegraph.....	Gold & S. Tol. Co.	34
July 2, 1872...	112,604, Printing Telegraph.....	do.	36
July 11, 1872...	112,334, Chron. Director.....	Gold & S. Tol. Co.	37
July 14, 1872...	112,407, Chemical Telegraph.....	Self & Harrington.	38
July 11, 1872...	112,709, Electro-Magnet.....	do.	39
July 11, 1872...	112,342, Printing Telegraph.....	Gold & S. Tol. Co.	43
July 11, 1872...	112,341, " " " " " " " " " "	do.	42
July 11, 1872...	112,335, " " " " " " " " " "	do.	43
July 11, 1872...	112,344, " " " " " " " " " "	do.	44
July 11, 1872...	112,342, " " " " " " " " " "	do.	45
July 11, 1872...	112,335, " " " " " " " " " "	do.	46
July 11, 1872...	112,335, " " " " " " " " " "	do.	47
July 11, 1872...	112,342, " " " " " " " " " "	do.	48
July 14, 1872...	112,406, Telegraph Instruments.....	do.	49
July 11, 1872...	112,446, Printing Telegraph. Inst.....	Gold & S. Tol. Co.	52
July 11, 1872...	112,335, " " " " " " " " " "	do.	53
July 1, 1873...	112,324, Printing Telegraph Inst.....	Gold & S. Tol. Co.	54
July 1, 1873...	114,651, " " " " " " " " " "	do.	55
July 26, "	112,115, " " " " " " " " " "	do.	56
July 1, "	114,646, " " " " " " " " " "	do.	57
July 26, "	112,115, " " " " " " " " " "	do.	58
July 23, 1873...	112,608, Galvanic Battery.....	do.	59
July 15, "	114,771, Telegraph Circuit.....	Self & Harrington.	60
July 4, "	112,601, " " " " " " " " " "	do.	61
July 27, 1874...	114,712, Telegraphic Alarm & Signal.....	do.	62
July 12, 1873...	111,714, Telegraph Circuit.....	Self & Harrington.	63
July 12, 1874...	112,648, " " " " " " " " " "	do.	64
July 12, 1873...	111,713, Chrono Chemical Tel.....	do.	65
July 1, 1873...	114,118, Printing Telegraph.....	Gold & S. Tol. Co.	66
May 19, 1873...	112,606, " " " " " " " " " "	do.	67
Sept. 9, 1873...	114,113, Telegraph Transmuting Inst.....	do.	68

Nov. 17, 1874...	114,449, Duplex Chemical.....	Self & Harrington.	69
Aug. 12, 1873...	111,774, Performer.....	Self & Harrington.	70
" " "	111,774, Chem. Telegraph.....	do.	71
May 12, 1874...	110,847, Receiving Inst. Chem. Tel.....	do.	72
Aug. 12, 1873...	114,771, Telegraph Instruments.....	do.	73
Feb. 16, 1874...	117,315, Chemical Telegraph.....	do.	74
Feb. 16, 1874...	117,312, Performer.....	Self & Harrington.	75
Nov. 9, 1873...	114,654, Solution.....	do.	76
Feb. 16, 1874...	117,314, Chrono Chem. Tel.....	Self & Harrington.	77
Mar. 2, 1873...	116,462, Chemical paper.....	do.	78
March 2, 1873...	116,465, Electro-Magnet.....	Self & Harrington.	79
Feb. 24, 1874...	117,315, Duplex Telegraph.....	do.	80
May 12, "	116,464, Duplex Battery Tel.....	do.	81
Feb. 16, "	117,312, Chemical Telegraph.....	Self & Harrington.	82
May 26, "	111,200, Auto. Tel. Remote.....	do.	83
March 2, 1873...	116,465, Chemical paper.....	do.	84
" 2, "	116,464, Chemical paper.....	do.	85
Sept. 8, 1874...	114,788, Alarm & Signal App.....	Domestic.....	86
Sept. 21, 1873...	114,961, Printing Telegraph.....	Gold & S. Tol. Co.	87
Aug. 11, "	116,465, Chemical Telegraph.....	Self & Harrington.	88
" 11, "	116,466, " " " " " " " " " "	do.	89
" 27, "	116,461, " " " " " " " " " "	do.	90
July 18, 1873...	112,308, Automatic (Remote).....	Self & Harrington.	91
Feb'y 22, "	112,116, " " " " " " " " " "	do.	92
" "	Duplex Telegraph.....	Self & Harrington.	93
" "	" " " " " " " " " "	do.	94
" "	" " " " " " " " " "	do.	95
" "	" " " " " " " " " "	do.	96
" "	" " " " " " " " " "	do.	97
" "	" " " " " " " " " "	do.	98
" "	Quadruplex Telegraph.....	do.	99
" "	Duplex " " " " " " " " " "	do.	100
Jan'y 10, 1873...	112,731, Telegraph Apparatus.....	do.	101
Oct. 6, 1873...	116,466, Solutions for paper.....	Self & Harrington.	102
Sept. 26, "	114,243, Automatic Telegraph.....	do.	103
" 28, "	116,461, Auto. Tel. Inst.....	Self & Harrington.	104
Oct. 6, "	116,467, Recording Points.....	do.	105
" 6, "	116,466, Preparing paper.....	do.	106
" "	Automatic Telegraph.....	Self & Harrington.	107
Nov. 10, 1873...	112,312, Electric Telegraph.....	do.	108
Dec. 21, 1873...	117,312, Telegraphic Apparatus.....	Self & Harrington.	109
" "	Duplex Telegraph.....	do.	110
" "	" " " " " " " " " "	do.	111
" "	Quadruplex Repeater.....	do.	112
Aug. 9, 1876...	110,887, Autographic Printing.....	do.	113
" "	Automatic Telegraph.....	do.	114
" "	Duplex Automatic.....	do.	115
Jan'y 26, 1871...	110,336, Automatic Telegraph.....	do.	116
" "	Automatic Telegraph.....	do.	117
Jan'y 22, 1871...	110,844, Telegraphic Alarm.....	Domestic Tel. Co.	118

Serial title of Army outfit.	Title.	Date of Patent.	No. of patent.
301	Jan. 16, 1925.	Automatic Tel.	164,218
302	"	"	164,219
303	"	"	164,220
304	"	"	164,221
305	Jan. 16, 1925.	Point-to-point for Chem.	164,222
306	"	"	164,223
307	"	"	164,224
308	Jan. 16, 1925.	Automatic Tel.	164,225
309	"	"	164,226
310	"	"	164,227
311	Jan. 16, 1925.	Chem. Tel.	164,228
312	"	"	164,229
313	"	"	164,230
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603	"	"	164,520
604	"	"	164,521
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608	"	"	164,525
609	"	"	164,526
610	"	"	164,527
611	"	"	164,528
612	"	"	164,529
613	"	"	164,530
614	"	"	164,531
615	"	"	164,532
616	"	"	164,533
617	"	"	164,534
618	"	"	164,535
619	"	"	164,536
620	"	"	164,537
621	"	"	164,538
622	"	"	164,539
623	"	"	164,540
624	"	"	164,541
625	"	"	164,542
626	"	"	164,543
627	"	"	164,544
628	"	"	164,545
629	"	"	164,546
630	"	"	164,547
631	"	"	164,548
632	"	"	164,549
633	"	"	164,550
634	"	"	164,551
635	"	"	164,552
636	"	"	164,553
637	"	"	164,554
638	"	"	164,555
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659	"	"	164,576
660	"	"	164,577
661	"	"	164,578
662	"	"</	

Abstracts of Edison's Abandoned Applications

These nineteen numbered pages contain abstracts of more than one hundred of Edison's abandoned patent applications, covering the period 1876-1885. The abstracts are in the hand of William H. Meadowcroft, Edison's secretary. The SN-number in the left margin is the serial number assigned by the Patent Office. The abstracts are from a miscellaneous collection of materials that Meadowcroft assembled for the preparation of Edison: His Life and Inventions by Frank L. Dyer and Thomas C. Martin (New York, 1910). The 1929 edition of the biography acknowledges Meadowcroft as a co-author.

Abstract of Edison
Abandoned Applications

487-x

1

S. N. 12580 ~~U.S. Pat. 5, 1884~~ ~~Dynamo~~

~~for two or more armatures in the field.~~

S. N. 61,955

(41)

May 20, 1882. Railway system for localities where traffic is too light for ordinary steam railways, or where traffic is limited to certain seasons. Claims include insulated car frame, electro-mag. traction device, and reverser controllable from distance

S. N. 158

(5)

Nov 8, 1878. Telephone. Transmitted ^{positive negative} ~~ac~~ currents by varying resistance of transmitter in comb. with telephonic bridge

No. 166.

(6)

Dec 9, 1878. Electric Light - Layers of incandescent metal and intervening pyroinsulation - & thermal circuit regulator. (Forfeited)

S. N. 19,845

~~Edison~~ (17^c)

Oct 30, 1880. Commutators. Hereby all the coils, except the one in the neutral point, remain in circuit, being connected in such arc, each coil remaining connected to circuit during rotation, except while in neutral point. (Arranged in ^{columns} ~~columns~~)

S. N. 19,844

(17^B)

Oct 30, 1880. Dynamos. Means for indicating thermal and magnetic conditions of dynamo or motor

S. N. 18,705

(17^A)

Oct 6, 1880. Edison & Johnson - Dynamo - Means for automatically cutting Dynamo out of circuit. Slave on dynamo shaft & circuit breaker automatically operated by longitudinal movement of slave.

S.N. 11, 243 June 3, 1880. El. Railway. Broad idea of using
partly or wholly
two rails, as conductors, vehicle with motor having
connection with rails, and stationary dynamos furnishing
current.

S.N. 14, 130 Dec 11, 1879. Carbons. Making filaments from
bistol board - enlarged ends.

S.N. 10662 May 31, 1880. Dynamos. Adjustable resistance in
combination with field magnets to regulate current.

S.N. 18421 Oct 1, 1880. Motors. Direct relates to means for
communicating motion from armature of motor to the
driven mechanism without use of belt, gear to
to diminish speed. First converting rotary motion of
armature into oscillating motion, then reconverting
the oscillating motion into rotary motion. Adjustable
double pawl carrier, ^{and pinion} adjustable connection between
them to vary throw of pawl carrier. (forfeited)

S.N. 27191 Feb 28, 1881. Carbons. Purified graphite or
plumbago pressed into moulds and carbon cut
therefrom.

S.N. 27484 Mar 5, 1881. System. Magnetic shunt switch
in series lamps

S.N. 4208 Dec 15, 1879. Phonograph. Longitudinal slit for
holding tinfoil. & several other mechanical details.

S.N. 4709 Dec 15, 1879 - Phonograph - This application covers a revolving plate or disk to receive the metal foil. Disk is placed horizontally & is mounted on a vertical revolving shaft. The surface of the disk is provided with a spiral groove or grooves, & metal foil is secured to the disk by a hinged ring frame. The speaking apparatus is upon an arm fitted to move both vertically and horizontally, & the disk is on a shaft that can be connected or disconnected from the motor at pleasure.

Nomenclature: "phonograph"; "phonogram" and "phonet"

(Only two actions in this case. Rejections were merely on technicalities in the description. The action case was evidently dropped on the account of Mr. Edison's being busy in electric light matters. Second action was dated May 2, 1882)

Case # 188 Dec 31, 1879 - Telephone - Diaphragm having metal arm resting upon revolving magnetized bar upon which is a helix. (In interference with Bell & decided in his favor)

S.N. 24440 Jan 17, 1881 - Electric Lamp - Plating ends of carbon filament to lead-in wires.

S.N. 71,757 Sept. 13, 1882 - Dynamot - Junco type with converging pole pieces.

- S.N. 23810 Jan. 11, 1881. Carbons - Plating the enlarged ends of carbon filaments. (25)
- S.N. 34392 May 27, 1881. Drop Light - Two side pieces with rod joining them at bottom. Lamp placed on this rod, which is insulated in middle & capable of being turned over so as to make lamp upside down. Frame suspended by metal bands which pass over wheels or rollers. (26)
- S.N. 36294 June 22, 1881. Rheostat. Resistor portions made of carbon. Invention also covers manner of uniting such carbon portions to metal conductors by electro-plating around the joint. (28)
- S.N. 36470 June 24, 1881. Carbons - Making filaments of long lengths of vegetable fibres to occupy little space, by winding in cone-like spiral. (30)
- S.N. 43164 October 4, 1881. Distribution System. This is a system for interiors, consisting of combination with the main conductors & house service box in street, of vertical conductors running through the house, a service box on each floor - vertical conductors passing through it - separate meters for each consumer, - and safety cut-off for each floor. (32)

S.N. 36467 June 24, 1881 - Electrical System for Railroad Trains.

(29)

Dynamo mounted on locomotive driven by separate engine supplied with steam from locomotive boiler. Lighting circuits throughout the train and magnetic brakes for each car.

S.N. 71762 Sept 13, 1882 - Secondary Batteries - ~~the~~ Electrodes for

(59)

lead storage battery each formed of a number of strips of lead, each of such strips being first twisted by itself, and all the strips being then twisted into a bundle. In this way the active material is held in place - (Forfeited)

S.N. 76381 Nov 9, 1882. Manufacture of lamps. A method

(66)

of equalizing resistance of carbon filaments by raising the filament of higher resistance to incandescence & depositing carbon thereon.

S.N. 74788 Oct 20, 1882. Lamps. To prevent carrying off

(65)

carbon to globe by covering leading in-wires, and the untaped ends of carbon with insulating material such as Japan varnish, collodion, &c

S.N. 68624 Aug 7, 1882 - Lamps. Method of cutting and

(48)

forming bamboo filaments.

S.N. 68608 Aug 7, 1882 - Lamps - Method of silvering one

(46)

side or end to reflect light down.

S.N. 68,613

Aug 7, 1882. Art of Obtaining Oxygen - Method

consists of filtering air through charcoal. A
 or hollow sphere ^{connected with an air pump}
 chamber, consisting entirely of charcoal, is enclosed
 in another chamber ^{also} connected with an air pump.

(47)

This enclosing chamber is provided with ~~the~~
 means for drying the air through inlet tubes
 containing sulphuric acid and fumes. (Potatoes)

S.N. 68,607

Aug 7, 1882 - Lamps - Arranging carbons so that

they shall have greater length without correspond-
 ing increase of radiating surface. Carbonized in
 compact spiral form and placed vertically.

(45)

S.N. 65,237

June 26, 1882. Lamps - Use of phosphorous

anhydride for drying

(44)

S.N. 65,236

June 26, 1882. Secondary Battery - An electrode

made of filamentary lead, woven, braided or
 otherwise formed into mats, pressed solid,

(43)

S.N. 65,234

June 26, 1882. System - Method of utilizing
 high tension currents on main conductors by
 charging storage batteries in series, which are
 discharged at low E.M.F. on consumption
 circuits, in multiple arc. Entire system
 outlined.

(42)

S.N. 68,649 Aug 7, 1882. Electro-Magnetic Railway Engine. Method of ~~driven~~ connecting and disconnecting. driven axles from motors by belt or other flexible connection and friction slits mounted on countershaft, in combination with... slowing down gearing -

S.N. 78,772 Dec 7, 1882. Regulator for Dynamo. The combination with a magneto electric machine & translating devices arranged in multiple arc, of an exciting machine for energizing the field of the other, & means actuated by variations in the number of translating devices in circuit, for regulating the current generated by the exciter

S.N. 70,288 August 25, 1882. Ore Separator. Machine for separating particles of free gold or other non-magnetic substances. Hard rubber cylinder and rubbing pad.

S.N. 69,264 Aug 14, 1882. Electric Railroad. This relates to insulating the rails and spikes with Japan, baked, also to providing an insulating cushion for the rails, composed of cloth or other flexible material, japanned and baked.

- S.N. 69256. Aug 14, 1882. Secondary Battery. For thermostatic device, such as lamp or heating resistance, to prevent solution from freezing.
(55)
- S.N. 69253 Aug 14, 1882. Manufacture of Incandescing Conductors. Forming sheets of nitro-cellulose by dissolving & flowing on glass; pressing between steel plates; then cutting filaments & carbonizing, or carbonizing sheets & cutting filaments afterwards.
(54)
- S.N. ^{73,556}~~73,555~~ Oct 6, 1882. Acoustic Telegraph. The receiver instead of being placed in the main line is placed in a local circuit at the receiving station, and is connected with the main line through an induction coil, whereof the primary is included in the main line & the secondary in the local receiver circuit.
(62)
- S.N. 74783 Oct 20, 1882. Incandescing Conductors. Forming sheets of parchmentized cellulose made of pure cotton with dissolved in Sulphuric Acid, Arsenic Acid or Chloride of Zinc - Pressing into sheets & cutting filaments therefrom.
(64)
- S.N. 72,526 Sept 22, 1882. System of Distribution. Covers the grounding of consumption circuits in feeder system for economy of metal. (Allowed Oct 18/82 but forfeited) (Nothing cited against this.)
(61^A)

S.N. 72524. Sept 22, 1882. Manufacture of lamps. Providing
 (61) lamp with a residual atmosphere of cyanogen gas.

S.N. 34395 - May 27, 1881. Electric lamps. Carbon of carb
 (27) board, so formed as to have greater radiating
 surface on its sides than upon its edges.

S.N. 42321 - Sept 19, 1881. Dynamo regulation. Method of
 (31) cutting generator out of battery by shunt.

S.N. 43969. Oct 17, 1881. Telephone. Division of application
 No 178 of June 2, 1879, made for purpose of separating
 matters not in interference. This covers a ring of
 yielding material forming a seal for the diaphragm,
 (33) a device to prevent diaphragm from slipping & a
 yielding presser acting against surface of diaphragm

S.N. 43970. Oct 17, 1881. Telephone. Also division of No 178.
 This division covers two springs & electrodes between
 (34) the springs, to which electrodes an initial pressure
 is applied, the same being modified by the vibrations
 of the diaphragm.

S.N. 45666. Nov 11, 1881. Lamps. Covers as U shaped clamps
 (35) on leading-in-wires and band to slip over after
 carbon is inserted.

S.N. 46755. Nov 28, 1881. Thermo-Electric Battery. Electroplating
 one element upon another, as copper, or silver
 (36) The whole plate is covered & then the metal is
 removed at edges by grinding, thus dividing deposit
 into two layers, one on each side of the plate.
 Heated at one end with hot water & at the other
 a heat radiator of metal coated with lamp black

- S.N. 46757. Nov 28, 1881. Operating Electrical Apparatus. For placing apparatus (such as cigar lighter) in a shunt around a resistance.
- (37)
- S.N. 46760. Nov 28, 1881. Arc Light. Arc lights in multiple arc. with regulating mechanism controlled by opposing solenoids or electro magnets.
- (38)
- S.N. 46821. Nov 29, 1881. System. Operating arc and incandescent lights in same circuit.
- (39)
- S.N. 47471. Dec 9, 1881. Lamps. Method of removing moisture by heating during exhaustion.
- (40)
- Case 121 - June 30, 1876. Quadruplex. This seems to cover the entire Quad. system, bridge method, including compensating condensers, one forming part of the bridge wire, the other forming part of a shunt around the artificial line.
- (1)
- Case 123. Aug 23, 1876. Acoustic Telegraph. The combination in a telegraph instrument of one magnet and two or more reeds, tuning forks or strings.
- (2)
- Case 126 - Dec 13, 1877. Acoustic Telegraph. Closed circuit in which acoustic transmitter produces rise & fall of tension; receiver in local circuit operated by alternating currents; & induction coil between them in ~~case~~ interposed between circuits.
- (3)
- Case 128, Dec 24, 1877. Acoustic Telegraph. Iron or steel diaphragm secured to a steel case, also resonant tube variable in length to adjust column of air to tone of transmitter.
- (4)

Case 172 - March 10, 1879. Candles or Conductors for Electric Light.

Candles, or conductors, formed of metallic oxides, by powdering & moulding - Material may be powdered & mixed with sugar, tar, silica or similar material & subjected to heat to cause the particles to adhere & burn out the unburned material. Oxides of cobalt, & nickel mentioned - Also Silicon, Boron and Zirconium. Conducting powder may be brought to incandescence by filling tubes of Zircon, Magnesia, Lime & with the powder & compressing between two metallic end pieces, such as platinum or Iridium. Also mentions native alloy of Bismuth and Iridium, called Iridosmine, - can be used this way,

Reissue - March 20, 1879. Perforating Pen. This is an abandoned application for Reissue of Patent No. 203,329.

S.N. 10,615. June 2, 1879. Telephone - This is another division of Case 178. (See page 9 of my abstracts)

S.N. 114/26. July 7, 1879. Telegraph Lines. - This case was assigned to Edison Electric Light Co. and substitute specifications were filed March 30, 1886. It covers underground conductors placed in metal tubes lined with insulating material, bringing them into boxes and connecting together there. Also covers the drawing of wires through line of pipes by cords & pulleys. This application clearly outlines the modern practice of drawing conductors & through underground conductors by men stationed at the boxes. Rejected on Eng. Pat. of 1866; 306 of 1863; 2091 of 1873. 1944 of 1876.

2206 ~~1898~~ - Sept 8, 1879 - Medicinal Preparation. To produce anesthetic effects upon the nerves of animals by external application to obtain relief from pain.

(11/)

	One 3.	Hydrate of Chloral
	4 "	Alcohol
	2 "	Chloroform
	2 "	Camphor
	2 minims	Oil Peppermint
	2 "	" Cloves
	3	permyrystic Salicylic Acid
	3 "	Nitrate Amyl (?)
U.S. Disp.	3 "	Opium
1044 (nck)	2 "	Morphine (Sulphate ?)
	2 ounces	Ether

19846 ~~1898~~ - October 30, 1880. Manufacture of Carbon. Method of forming carbon articles of definite desired shape by cutting or shaping the same from paper & carbonizing between plates, or forming hollow articles from paper maché to ~~forming~~ with moulds & plunges & carbonizing them - Flexible carbon articles may be ^{so} made

21095 ~~1898~~ - Nov. 24, 1880. Equalizing Resistance of Carbon. This was assigned to The Edison Electric Light Co., and a Substitute Specification was filed March 15, 1894.

(19) This covers the ^{regular} process of "treating" carbons in carbon vapor.

22,202 ~~1898~~ - Dec. 14, 1880, Telegraph Apparatus. This invention

(20) covers a relay without armature & retractile spring by taking advantage of the expansion of iron when magnetized & demagnetized. This relay consists of ~~an~~ ^{an} ~~iron~~ ^{iron} ~~rod~~ ^{rod} ~~inserted into~~ ^{inserted into} ~~a~~ ^a ~~tube~~ ^{tube} ~~containing~~ ^{containing} ~~mercury~~ ^{mercury} - By fine adjustment signals are transmitted by ~~mercury~~ ^{mercury} making contact with needle

(over)

The vessel is the core. A needle in an insulating
block is mounted in a small tube forming part of
vessel - This is capable of fine adjustment. ^{& battery} Sounder, is
in local circuit between vessel and pin. (Last action
was letter from Examiner, dated Nov 29, 1886, stating that
as requirement for working model had not been
complied with, no further action would be taken
until model was furnished)

S.N. 22391 - Dec 15, 1880. Incandescent Electric Lamp. This application seems to be an attempt to elaborate upon the original Filament Patent by going very thoroughly into the art and endeavoring to tie up loose ends of the earlier patent. It was strenuously contested in the Patent Office until March 12, 1889, when final letter of rejection was written. The case seems then to have been abandoned.

(21) S.N. 68645. Aug. 7, 1882. Electro Magnetic Railway Engine. Uses use of adjustable resistance to vary speed of motor; and compound winding on motor to compensate for changes of Counter E.M.F. (Last action in 1891)

(52) S.N. 68644 Aug 7, 1882 - Regulation of Generators. Device for throwing counter E.M.F. into field of generator by electro-magnets connected together & with commutator bars and ^{rotating commutator} brushes, operated by independent electric motor and governor.

(51) S.N. 68634 - Aug 7, 1882 - Regulation of Generators. Brushes of machine are attached to a pivoted arm having a spiral spring at each end. At one end is ^{the armature of} an electro magnet ~~which~~ ^{is} connected in main or derived circuit. The electro magnet varies in strength in accordance with changes of load & shifts commutator brushes accordingly.

(44) S.N. 68641. Aug 7, 1882. Operating Motors & Generators. Method of connecting the armatures in series in the same circuit, & of arranging field coils of each machine in shunt around its armature coils ^{means for} & regulating each machine independently.

(50)

S.N. 72523. Sept 22, 1882. Dynamo - Compound winding. One limb wound ^{with} coarse wire & which is placed directly in one of the main conductors from commutator. The other limb wound with fine wire & connected in multiple with mains, & a shunt also in the same circuit in multiple.

(60) S.N. 74474. Oct 17, 1882. Dynamo - Non-commutator generator. "In a dynamo or magneto electric machine the combination with the field magnet, of a core within the influence of each pole, a magnetic connection between such cores, and a bobbin upon either or upon each of said cores." (Rejected by reason of working model not being shown)

(63) S.N. 81838 Jan 8, 1883 - Generating Electricity. Process of generating electricity by chemically reducing an oxide of lead to form one electrode, chemically raising raising an oxide of lead to form the other electrode & placing said electrodes in dilute sulphuric acid.

S.N. 81732 Jan 8, 1883 - Lamps - Coating filaments with silicon to make them more durable & prevent carrying.

S.N. 81329. Jan 8, 1883. Commutator - This covers a commutator with removable bars.

S.N. 81327. Jan 8, 1883. Secondary Battery. Electrode made by moulding oxide of lead in hollow form, perforated, reduce it and then fill with molten lead.

S.N. 81853 - Jan 15, 1883. Lamp - Simply covers enlarged ends of filament made in tapering form instead of square shoulders.

- S.N. 81,854. Jan 15, 1883. Lamp. This appears to be a special attempt to tie up loose ends in the filament situation - I think the idea was to make legal position more secure.
- S.N. 81,241 - Jan 18, 1883. Manufacture of ^{Condensers for} lamps - Covers methods & devices for preventing the curling of filaments during carbonization, by ~~the~~ moulds which retain the sheets or blanks under pressure during carbonization, while permitting of contraction.
- S.N. 88357. March 16, 1883. Electric Motors - A motor with two armatures on one shaft, oppositely wound, so that motor can be reversed.
- S.N. 91952 - April 17, 1883. Manufacture of lamps. Method of preventing carrying by coating the leading in wires & clamps with carbon.
- S.N. 92613. April 17, 1883. Conductors for Lamps. Making filaments of parchmentized material & carbonizing.
- S.N. 91955. April 17, 1883. Lamps - ^{Driving} clamping filament by making leading-in-wires into split cylinders & ~~clamping cylinders upon the~~ inserting ends of filament therein & clamping same.
- S.N. 99552. June 29, 1883. Dynamo - Mounting dynamo upon ways, with means of moving same to & from engine to adjust length of belt.
- S.N. 99560. June 29, 1883. Fixture - For group of lights to arrange same radially and in a horizontal plane on top of a pole, with a closed opaque or translucent reflector above them.

- S.N. 108561. Oct 10, 1883. Generator. This is ^athe type of Gramme machine.
- S.N. 108564 Oct 10, 1883 - Lamp - Method of attaching filament to leading-in-wires by flattening ends & bending them into a clamp, of latter, ^{electro-plating} ends of filament, and placing them in clamps then slipping over them a split-sleeve.
- S.N. 111,327. Nov 9, 1883. Galvanic Battery. Negative element of carbon surrounded by mixture of divided carbon & peroxide of lead, enclosed in covering of tessellated fabric.
- S.N. 114,284. Dec 12, 1883. Distribution System. Method of disconnecting a generator from system by reducing the current before cutting out (Interference with Wheeler - decided in his favor)
- S.N. 118546. Jan 24, 1884. Electrical Conductors. Relates to insulating & protecting coverings for conductors. First they are wound with an insulating covering, then with metallic foil and then with retaining covering.
- S.N. 118543 - Jan. 24, 1884. Dynamo - Method of indicating at any time the amperes developed by any particular generator. Consists in an indicator pointer carried by the pivoted yoke ~~carried by the~~ on which the brushes are mounted. A scale is determined by test & placed above the yoke.
- S.N. 126,801. April 5, 1884. Lamp - To give filament a greater light-giving capacity by coating same with substance reflective of light, such as Silicon, Bismuth, Osmium or Iridium. Process by electro-vacuum deposition. (Edison's Case 615 - Serial No. 118942)

S.N. 126,804 - April 5, 1884 - Dynamos - For two or more
armatures in one field -

S.N. 132,357 - May 22, 1884 - Pulleys - Edison and Livo.

A pulley having a sheet metal shell cast
thereon by a fusion of the surface of the
wrought metal with the cast metal.

S.N. 136,523 - July 1, 1884 - Electrical Conductors - Method
of insulating a conductor by covering same with
paper or textile covering, then saturating such
covering with a boiled drying oil in a liquid
or semi-liquid state, allowing same to dry, &
then applying a braided, wound or woven exterior
covering.

S.N. 136,522 - July 1, 1884 - Dynamo Telegraphy. "The
combination with a dynamo circuit, of two or
more circuits derived therefrom containing resistances,
two or more quadruplex lines and instruments,
shunts around portions of said resistances to
the quadruplex instruments, and ground connections
through separate grounding resistances."

S.N. 136,521 - July 1, 1884 - Dynamo Telegraphy. Object to
produce simple & efficient arrangement whereby several
telegraph or other grounded lines can be operated from
the same dynamo circuit & can be given
currents of different tensions; and further to also
provide means for giving such lines currents of
opposite polarity. A further object is to provide
means for working the same from the same
dynamo circuit making them practically independent
of one another. (There was evidently a hard fight
in this case - A great many actions - the final
one being Aug 21, 1894)

- S.N. 157,943 - March 6, 1885, Telephone. A division of Edison case No 159 and tension as No 159 D. (This application is filed by Serrell). "The combination with a telephonic transmitting instrument & its line circuit, of a distant electro magnet, a tension regulator acted upon by such magnet, a local circuit passing through the tension regulator and through the primary of an inductorium with its secondary going to the second line circuit, whereby the electrical variations produced by the transmitter in the first line circuit cause corresponding electrical variations in the second line circuit.
- S.N. 165,704 - May 16, 1885 - Paper. Method of making moisture proof, insulating & dielectric paper by impregnating thin paper with an oxydized, boiled drying oil such as linseed oil.
- S.N. 179,867. Oct. 14, 1885. Telephone Transmitter. Relates to extra or guard diaphragm to prevent the effect of "wind rushes" - One of the claims reads "In an electric telephone transmitter, the combination with the main diaphragm and current carrying electrodes affected thereby, of the extra diaphragm supported rigidly from the case of the instrument & situated between said main diaphragm & the mouth piece."
- S.N. 186,808 - Dec 26, 1885 - Dynamo. To prevent sparking at Commutator. Second claim reads "In a dynamo electric machine or electro-dynamic motor, the combination of two or more

19

continuous or closed circuit armature windings,
connected each at intervals to commutator bars,
said bars being arranged alternately or in
succession, and commutator brushes whose bearing
is not sufficient to bridge bars of the same
winding.

149 drawings

Certified Copies of Seven Abandoned Patent Applications

The originals of these seven applications, Cases A through G, for patents covering improvements in duplex telegraph apparatus were filed in April 1873. Case H, another application concerning duplex telegraphs (not present here), was filed on April 26, 1873. All eight applications were rejected in May 1873. Although some of these applications were subsequently amended, Cases A through G were eventually abandoned. Case H was amended in May 1873 and again in March 1875, and was issued as patent number 162,633 on April 27, 1875. Between 1876 and 1878 this patent became the subject of at least three suits involving the Western Union Telegraph Company against Thomas A. Edison and George Harrington. (See the Quadruplex Case volumes in the Litigation Series.)

These certified copies of Cases A through G were obtained from the Patent Office on April 11, 1907 to be used as exhibits in Master's proceedings resulting from a suit brought in 1876 by George Harrington and Thomas Edison against the Atlantic and Pacific Telegraph Company and Jay Gould in United States Circuit Court, Southern District of New York. On December 20, 1906 the Court ordered an accounting and appointed a Master to determine damages to be awarded to the Complainants for infringement of Edison telegraph patents. Hearings before the Master commenced in February 1907. The copies of the abandoned patent applications were introduced as Complainants' Accounting Exhibits numbers 67 through 73 on April 29, 1907. The first page of each application contains the inscription "C.A.Ex." written in ink and followed by the exhibit number. The applications are not reproduced in the printed record of the proceedings before the Master.



To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the
Record of this office of the File Wrapper
Contents and Drawing in the matter of the
Abandoned Application of
Thomas A. Edison
Filed April 22, 1873
for
Improvement in Duplex Telegraph Apparatus.

In testimony whereof I have hereunto set my hand and
caused the seal of the Patent Office to be affixed at
the City of Washington this 11th day
of April, in the year of our Lord
one thousand nine hundred and seven
and of the Independence of the United States of
America the one hundred and thirty first.

E. Moore

Assistant Commissioner of Patents.

P. G. 76
\$ 15

P E T I T I O N .

To the Commissioner of Patents of the United States of America:

The Petition of Thomas A. Edison of Newark in the
County of Essex and State of New Jersey

Respectfully Represents -

That your petitioner has invented a new and Improved Duplex
Telegraph Apparatus which he verily believes has not been known or
used prior to the invention thereof by your petitioner. He there-
fore prays that Letters Patent of the United States of America
may be granted to him therefor, vesting in him and his legal
representatives the exclusive right to the same, upon the
terms and conditions expressed in the Act of Congress in
that case made and provided; he having paid Fifteen Dollars
into the Treasury of the United States, and otherwise com-
plied with the requirements of said Act. And he hereby
authorizes O. D. MUNN and A. E. Beach, of the firm of
MUNN & CO., of the Cities of New York and Washington, or
their accredited Agents, to act as his Attorneys in pre-
senting the application, and in making all such alterations
and amendments as may be required, and to sign his name to
the drawings.

Thomas. A. Edison

OATH.

City & County of New York }
State of New York } ss.

On this Ninth day of April 1873, before the subscriber,
A Notary Public, in and for said County, personally ap-
peared the above-named Thomas A. Edison and made solemn
Oath that he verily believes himself to be the original
and first inventor of the within described Improved Duplex
Telegraph Apparatus and that he does not know or believe
that the same was ever before known or used; and that he
is a citizen of the United States

T. B. Mosher
Notary Public

(Notarial Seal)

Specification - describing
a new and Improved

Duplex Telegraph Apparatus:
invented by Thomas A. Edison
of Newark, in the County
of Essex, and State of
New Jersey -

My invention relates
to apparatus for simultaneous
transmission of two dispatches
or signals from opposite ends
over the same line wire;
and consists in combination
with opposing relay and local
magnets, of a device which
by mechanical means, prevents
the lever vibrating between
said magnets from responding
to the signals transmitted from
the home station, but does
not prevent the same from
responding to the signals from
the distant station -

In the accompany-
ing drawing, -

Figure 1, represents a
plan view of my apparatus

for double transmission and

Figure 2. a modification
of the same, showing the
arrangement of an opposing
& local battery for neutralizing
each other, whereby it is not
necessary to break the circuit.

Similar letters of
reference indicate correspond-
ing parts,-

In the drawing

A, is the receiving magnet.
B. is an opposing magnet,
operated by a local battery,
L.B. placed in circuit with
the sounder lever S L, by
spring extension a, and con-
tact b.

L. is the armature
lever of the receiving magnet
A, and local magnet B,
pivoted so as to vibrate be-
tween them.

S, is its spring,
the tension of which is great-
er than the power of each
magnet singly, but of less
tension than the combination

of either magnet with the
current of the line.-

S M is the sounder Magnet, operated by the sounder battery S B, and key R, d, the contact stop connecting main battery M B, by sounder lever S L, and wire m, to the line wire, R, A rheostat, placed between relay A, and the earth - plate E, and transmitting part of the force of the main battery to the earth, sending the other part of the current to the distant station without overcoming the tension of spring S -

The local circuit is closed, when the home station is not transmitting, the local magnet being not strong enough to attract the lever L, on account of the resistance of spring S. If however the distant station is sending, the combined power of the line current and

local current overcomes the resistance of the spring S. and the relay responds to the signals of the distant station.

When, however, the local circuit is opened, by the depression of key R, and attraction of the sounder lever S L, to its magnet, the sounder lever breaks contact with b, and closes the circuit with the main battery at contact d, the current passes through the relay A, to the line without moving the lever L, not being strong enough to overcome the resistance of spring S - Thus the signals of the home station are transmitted through the receiving magnet, which is always in circuit with the distant station, without responding to them - If however, a current be transmitted from the distant station simultaneously with

the closing of the main circuit at the home station, the power of the electro magnet - A, is increased, a greater power is exerted on the vibrating lever L, namely: the combination of the power of both main batteries and the resistance of the spring S, is overcome, so that lever L moves, transmitting the signals of the distant station:

The relay at the other end of the line responds in similar manner to the signals ^{the} of home station, transmitting thereby simultaneously the signals from either station at the same time.

By connecting the local battery L B, with an opposing battery O B, in the same circuit they will ^{other} neutralize each, but preserve at the same time the continuity of the circuit.-

The magnet B, discharges it-
self within its own circuit
for the purpose of being
rendered more sluggish, avoid-
ing thereby the danger of
attracting lever L, and creating
a confusion of signals.-

Having thus described
my invention -

I claim as new
and desire to secure by
Letters Patent.

1st The armature lever
L, placed between the receiving
and local magnets A and B,
having strong spring S, to be
vibrated by the joint action
of either with the line
current, when singly they
are too weak to change its
position substantially as de-
scribed.-

2d The sounder lever
S, L, having spring extension a
or equivalent, in combination
with the contact stops b, d, to
constitute a joint conductor
for the current of the
main or local battery, as
described.-

3rd The combination

of the receiving magnet A,
with the main battery M
B, sounder lever S L, and
rheostat R, to regulate out-
going current of main battery
and establishing earth circuit,
substantially as and for the
purpose described .-

Thomas. A. Edison

Witnesses:

Paul Goepel.

T. E. Mosher

2.

U. S. Patent Office,
Washington, D.C., April 30th, 1873.

T. A. Edison
Care Munn & Co
Present

Please find below a Communication from the Examiner
relative to your app'n for patent for Duplex Telegraph,
Cass A, filed April 21st 1873

72/62

Very respectfully,

Commissioner.

Examiner's Room, No. 98

This app'n has been examined and it is found 1st that
the nature of invention does not correspond with claims
presented.

2d That there are a number of misnomers as "relay A" when
A is not shown as a relay, "Sounder Magnet S. M." when it
is not shown as a sounder, and the Key K is described as
"Key R", "L.B. placed in circuit with the Sounder lever S, L"
when S, L, is not a sounder lever, as shown & described and
L, B, is not placed in circuit with it.

As to the claims the 1st needs amendt., to render it
clear.

The 2d is only an ordinary relay having both front
& back contact stops, completing circuits, as shown in patent
of A. C. Holcomb, May 13 1860 (Relays),

The 3d is for the most usual combination of elements
in a Duplex Appa, see Stearns patents, 78,547 & 78,548 June
2d 1868.

A patent is accordingly refused.

Z. F. Wilber

Rcr

"Case A"

Washington D.C.

May 14th 1873.

Hon M. D. Leggett
Commr. of Patents

Sir:

I hereby amend the specification in my application for Letters Patent for Duplex Telegraph Apparatus, filed April 21st 1873, by erasing all of specification except signatures and substituting;

"To all whom it may concern:

Be it known
that I, Thomas A. Edison, of Newark, in the County of Essex, and State of New Jersey, have invented a new and Improved Duplex Telegraph Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to a novel apparatus for simultaneous transmission of two signals or dispatches from opposite ends over the same line wire, and consists first in placing the operating armature-lever at each station between two electro-magnets, of which one receives the current from the distant station, while the other receives its current from the home station, both currents jointly sufficing to operate said lever, while either alone is not of sufficient strength, a spring, with which said lever is connected, and which has more strength than either current alone, counteracting the single current of either battery.

*Excess and
insufficient
force A.
Oct 11/73*

The invention also consists in placing the armature lever of the sending magnet between two contact stops, so that such lever, when off its electro magnet, will, by contact with one of the

stops establish a current for a local battery, while, when in contact with the other stop it will establish a current with the main battery, thus serving in either position to keep up certain currents, for purposes

hereinafter more fully set forth.
Amended A.
Oct. 11/73

Third my invention consists in so combining or connecting a rheostat with the electro magnet at the end of the main line, that such rheostat will serve to receive the current from the distant station and also in part to absorb the power of the transmitting main battery.

In the accompanying drawing

Figure 1 represents a plan view of my apparatus for double transmission, and

Figure 2 a modification of an opposing and local battery for neutralizing each other,

whereby it is not necessary to break the circuit.

A is the receiving magnet, B an opposing magnet, operated by a local battery L B, placed in circuit with the armature lever S L of the sending magnet S L, which lever plays between two contact stops b d and which, by preference, has a spring extension a at its outer ends. L is the or sounder armature, lever of the receiving magnet A and local magnet B, pivoted so as to vibrate between them. S is its spring, the tension of which is greater than the power of each current singly, & less than their combination^{ed} power of any two currents, whether the same are created by the joint action of both main batteries or by the action of the distant main battery with the local battery of the home station.

S M is the sending magnet, operated in the usual manner

in duplex apparatus by its battery L B and a key L, d is a contact stop, connecting main battery M B by armature lever S L and branch wire m to the line wire.

R is a rheostat connected by a conductor with the magnet A, the branch m reaching such conductor as shown. The rheostat R also connects with the earth

Eraser 4th
insert for
Smith B.
Oct. 11/73
at E and transmits part of the force of the main battery M B to the earth, allowing the other part of the current to pass to the distant station without overcoming the tension of spring S, because, when the circuit of the main battery is closed, that of the local battery must be open at b.

normally
The local circuit is closed, when the home station is not transmitting, the local magnet alone, ^{not} being met strong enough to attract the lever L on account of the resistance of

spring S. If however the distant station is sending, (the local circuit being closed) the combined power of the line current and local current overcome the resistance of spring S and the lever responds to the signals from the distant station.

When however the local circuit is opened by the depression of key K and consequent attraction of the lever S L to its magnet, such lever breaks throwing magnet B out of circuit, contact with E, and closes the circuit of the main battery.

at contact d, so that the current from M B level S L, wire m, and rent passes through the magnet A to the line, without moving

the lever L, the current of the (M B) main battery at the home station alone not being strong enough to overcome the resistance of spring S. Thus the signals of the home station are transmitted through the receiving magnet (which is always in a circuit with the

distant station) without ^{its} res-
ponding to them. If however, ^{to the home}
a current be transmitted, station
simultaneously with the clos-
ing of the main circuit at
the home station, the power
of the electro magnet A is
increased, ^{since} the main bat-
teries of the stations are con-
nected with their opposing poles,
so that a greater power is
exerted on the vibrating lever
L, namely the combination of
the power of both main bat-
teries, ^{thus overcoming} and, the resistance of
the spring S is overcome.

Both levers L then respond and
the signals of both, home and
distant stations are trans-
mitted.

By connecting the local bat-
tery D B with an opposing bat-

Each of tery O B in the same circuit,
insert per (see Fig. 2) they will neutralize
Amult R. each other, but preserves at the
Oct. 11/3 same time the continuity of the
circuit. The magnet B discharges

itself within its own circuit, for
use for the purpose of being rendered more
sluggish, avoiding thereby the danger
of attracting lever L and creating
a confusion of signals.

Having thus described my in-
vention, what I claim as new
and desire to secure by Letters
Patent is:

1st. The armature lever L combined
with and placed between the
electro magnets A and B, which
connect with the distant and
& arranged
home batteries, to actuate the
lever by the joint action only of
both said batteries, as specified.

2d. The armature lever S L of the
sending magnet, placed between
two contact stops b d for alternate
creation of currents from different
batteries as set forth.

3d. The combination of the rheostat

R, with the electro magnet A and
Case and with a branch m of the connecting
insert for wire, so that such rheostat will
Smith & receive the distant current and
Coch. 11/43 part of the current from the trans-
mitting battery M B, as described".

Thomas A. Edison

per Munn & Co

Attorneys.

(No. 1.)

June 6th

U.S. Patent Office,
Washington, D. C. June 5", 1873.

T. A. Edison

Care Munn & Co

Present

Please find below a Communication from the Examiner
relative to your appn for patent for Duplex Telegraph
Apparatus, Case A. filed April 21" 1873

72/62

Very respectfully

Commissioner.

Examiner's Room, No. 98

As amended the presentation of this case does not seem
to be entirely clear.

The description of the Rheostat R on page 5 is hardly
understandable, nor is it seen how it "transmits part of
the force of main battery to the earth", (The 3d part of
statement of invention, relating to the Rheostat, is also
cloudy).

The description of Fig 2 likewise fails in making the
arrangements thereof clear. It is not seen therefrom how
or where O. B. & L. B. will neutralize each other, nor how
or why magnet B discharges itself sluggishly

The 2d claim is rejected for the reason that it is
common for one armature to control two circuits and this is

virtually what said claim is for. See for instance Appt's patent of Sept 17th 72 No 131,339, Moreover the armature lever form^{does not} "creates currents" as therein set forth, it merely acts as a circuit closer .

As to the 3d claim, all of the Stearns Duplex patents show a rheostat used in same connexion as app't does (judging from his drawings) viz to regulate the force of the current by throwing a greater or less resistance into the circuit. App't however has not clearly described the relation of his rheostat to, and its connexion with the other devices. He should give an ^{explicit} clear description of the various circuits formed in the varying positions of the keys, what circuits pass through (and the rheostat, and when. This is especially important in view of the fact that the fundamental devices used in Duplex telegraphs are old, viz Magnets, armatures & rheostats, the novelty generally being in their arrangement in circuits.

This appn is accordingly again rejected

Z. F. Wilber

Exr

"Case A".

Washington, D. C.

October 10th, 1873.

Hon M. D. Leggett

Commr. of Patents

Sir:

I hereby amend the specification
in my application for Letters Patent
for Duplex Telegraph Apparatus,
filed April 21st 1873, by canceling
(pages 2 & 3)
recital of invention, and inserting;

Amend A.
Oct. 11/73 "My invention relates to an im-
proved apparatus for simultaneous
transmission of two signals or
dispatches from opposite ends
of the same line wire, and con-
sists in so arranging the operat-
ing armature-lever (at each station)
with two electro-magnets- one of
which receives the current from
the distant station, while the
other receives its current from
the home station - that both cur-
rents jointly suffice to operate said
lever, while either alone is not
of sufficient strength - a spring,
with which said lever is con-

nected, and which has more strength
than either current alone, counteracting
the single current of either battery -

Also by canceling lines on page 5
between 6th and, ²² 24th, and inserting;

"Said

branch wire m has also an ex-
tension w leading to rheostat R, which
has connection with the earth as
shown. The main battery M, B, is also

*Amolt B.
Oct. 11/3.*

connected with the rheostat and
the earth (E). Hence, when the
local circuit is closed, the lever
S L is freed from contact-stop
b and forms connection with d,
so that the battery M B at once
sends a current through said
lever over branch wire m and
magnet A to the line - the magnet
B being then rendered migratory
by the break in its circuit at b
so that the tension of the spring
S is not overcome by magnet
A and hence no signal is given
by the relay, while the rheostat
R whose resistance is greater

than the line, prevents short-circuiting
(except as to a small portion of
the current) with the earth".

Also by canceling last 7 lines page
7 and first 5 lines page 8, and in-
serting;

"To recapitulate, when the
lever S L is open (as shown in the
drawing), the local magnet B aids
magnet A in attracting the lever
L when the distant station is
transmitting. When the lever S L is

And it is
Oct 11/73
closed thus breaking the local
circuit, in other words, when both
stations are transmitting, it is
evident the main battery at each
station not only acts in its
own magnet A through lever S L
and wire M, but on the other
magnet at the other end of the
line - as before explained.

Thus the magnet A of each
station is acted on by two bat-
teries at once, whether the lever
S L be open or closed, the lever
L being in either case caused to

give the required signal.

I show in fig: 2 a modification of the local arrangement of battery, circuit wires, and transmitting key above described and illustrated in fig. 1.

S L is the sending lever having contact stops a and b as before.

But in addition to the battery

L B, I employ an opposing battery

O B, the positive (or negative) pole

And the of the one being connected with

Oct. 11/73 the like pole of the other. The

helix B is connected with one

pole (-) of the battery L B and

with a wire which passes between

contact stop b and the cor-

responding (-) pole of battery O B.

A wire O also connects lever S L

and the two contiguous and

opposed poles of both batteries -

Hence, when the lever S L, is

open (as shown), the magnet B

is affected or charged, since

a shunt circuit being formed

through O B, a b, lever S L and

wire O, another circuit will

exist through battery L B; magnet
B, lever S L and wire O. Thus
the force of one of the two

Amold L. batteries is exerted on B when
Oct. 11/73 the lever S L is open.

If, however, said lever be closed,
so that a and b are discon-
nected, the two batteries neutralize
each other and magnet B is
unaffected-

Also by canceling claims and in-
serting:-

The combination in a duplex
telegraph apparatus of the armature
lever L and magnets A and B in in-
Amold L. dependent circuits and neutrally acting
Oct. 11/73 on said armature, and so arranged
that the force of the current in
either circuit singly cannot overcome
the tension of the armature-lever spring,
the force of two batteries being neces-
sary thereto, as shown and de-
scribed -

Thomas A Edison

per Munn & Co

Attorneys.

New York, Oct. 15th 1873

Sir:

I hereby appoint Lemuel W. Serrell, New York, my agent and Attorney, in relation to my application for a patent on Duplex Telegraphs revoking all previous authority and authorize him, or his substitute, to do whatever may be necessary in the premises, as fully and entirely as I could do if personally present, and to receive the Patent when granted.

Respectfully Yours,

Thos A Edison

Hon. M. D. Leggett

Commissioner of Patents.

OFFICE FOR PATENTS,

119 & 121 Nassau Street, New York,

Oct. 15th 1873

The correspondence on this case, and also the Patent, when granted, you will please address to my care. Oblige by returning the drawing

Respectfully Yours,

Hon. M. D. Leggett

LEMUEL W. SERRELL.

Commissioner of Patents.

72/62

U. S. PATENT OFFICE.

APPLICATION OF

T. A. Edison,
Filed Apl. 21, 1873.

Contents of This File.

- 1 Application
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Case A.

1873.

Miller

72/
62

No.

Thomas A. Edison.

Of Newark,
County of Essex,
State of New Jersey.

Duplex Telegraph Apparatus.

Rec'd April 21 , 1873.

Petition " " "

Affidavit " " "

Specification " " "

/ Drawing " 22 "

Model " " "

Cert. dep.

/ Cash \$15. April 21 , 1873.

Add'l Fee Cert.

" " " Cash

Examined

2/ Issue

4 Patented

Recorded vol. , 18 ,

Circular page

ABANDONED.

Munn and Co.

Present,

Lemuel W. Serrell

New York City

1873.

Reg ^d	Apl	30 th	1873
"	June	5 th	"
Letter	Octr	18 th	"

R.M.
L. J. H.

Fig. 1.

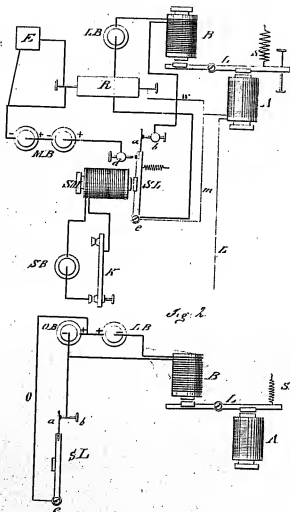
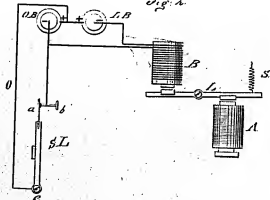


Fig. 2.



Witnesses:

Chas. Nida
Obregon

Inventor:

J. H. Edison

Per

Wm. L.

Attorneys

Appl. 36, 1791

2-389.

E 136

FOR IDENTIFICATION.



To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the
Records of this office of the *File Wrapper*
Contents and Drawing in the matter of the
Abandonment Application of
Thomas A. Edison
Filed April 22 1873
for
Improvement in Duplex Telegraph Apparatus

In testimony whereof I have herewith set my hand and
caused the seal of the Patent Office to be affixed at
the City of Washington this *11th* day
of *April*, in the year of our Lord
one thousand nine hundred and seven
and of the Independence of the United States of
America the one hundred and *thirty-first*.

Edison
Commissioner of Patents.

PG. 157H

P E T I T I O N .

To the Commissioner of Patents of the United States of America:

The Petition of Thomas A. Edison of Newark, in the County of Essex and State of New Jersey RESPECTFULLY REPRESENTS - That your petitioner has invented a new and Improved Duplex Telegraph Apparatus which he verily believes has not been known or used prior to the invention thereof by your petitioner. He therefore prays that LETTERS PATENT OF THE UNITED STATES OF AMERICA may be granted to him therefor, vesting in him and his legal representatives the exclusive right to the same, upon the terms and conditions expressed in the Act of Congress in that case made and provided; he having paid Fifteen Dollars into the Treasury of the United States, and otherwise complied with the requirements of said Act. And he hereby authorizes O. D. MUNN and A. E. BEACH, of the firm of MUNN & CO., of the Cities of New York and Washington, or their accredited Agents, to act as his Attorneys in presenting the application, and in making all such alterations and amendments as maybe required, and to sign his name to the drawings.

Thomas. A. Edison

OATH.

City & County of New York)
 ss.
State of New York)

On this Ninth day of April 1873, before the subscriber,
A Notary Public in and for said County, personally appeared the
above-named Thomas A Edison and made solemn Oath that he verily
believes himself to be the original and first inventor of the
within described Improved Duplex Telegraph Apparatus and that
he does not know or believe that the same was ever before known
or used; and that he is a citizen of the United States.

T. R. Mosher

Notary Public.

(NOTARIAL SEAL)

Specification describing
a new and Improved
Duplex Telegraph Apparatus
invented by Thomas A. Edison
of Newark, in the County
of Essex, and State of
New Jersey.

My invention has for
its object the simultaneous
transmission of two signals
over the same wire, but
in opposite directions and
consists of the combination
of two relays with their
armature lever, pivoted be-
tween them and placed
at different distances from
the same, so as to pre-
vent the relays to respond
to the signals transmitted
from the home station
without being prevented from
receiving the signals of the
distant station.

The accompany-
ing drawing represents a plan
view of my improved appa-

ratus for double transmission, in which A. and B. are the receiving magnets. L. their armature lever, pivoted between them and adjusted at greater distance from magnet A. than from magnet B. requiring therefore an increased amount of power to attract the same to A. instead to magnet B. The magnet B. is connected by wire m, with contact stop a, and by spring contact z, to the earth. An insulated extension a', of contact, a, serves also as back stop for sounder lever S L. which acts, on closing to the sounder magnet S. on a second contact z', of spring contact z, disconnecting the stops a B, and throwing relay B, out of circuit. Magnet A, is connected by wire m' with the line and over the main battery M. B. to sounder lever

S. L. operated by means
of key K, sounder battery
S. B. and magnet S.

By closing the sounder lever
S.L. the same acts on con-
tact x' separating contacts
a. z. and throwing magnet B.
out of circuit. The current
of the main battery M B.
passes through magnet A. to
the line. Magnet A. is
placed at such a distance
from lever L. that the power
of the main batter M: B. is
insufficient to attract the
same, the signals are there-
fore transmitted to the dis-
tant station without being
responded to by the home
station. If however the sounder
lever S L. be open, the main
battery M.B. and magnet A,
are thrown out of circuit and
magnet B. being adjusted
much closer to lever L. and
placed by contacts a. z. in
circuit, attracts lever L. and
responds to the signals of the

distant station. The line current is then conducted by contacts a. 2. to the earth B. When both stations are transmitting, so that sounder lever S. L. is closed at each station, the combined strength of the main batteries both of the home and distant station is passed through magnet A. attracting the armature lever L. and responding thereby to the signals from the distant station.

Having thus described
my invention -

I claim as new
and desire to secure by
Letters Patent.

1st. The pivoted ar-
mature lever L. in construc-
tion with the magnets A.
and B. adjusted between
them as set forth and opera-
ted as described.

2^d The sounder
lever S L. in connection with
spring contacts a, a'. and con-
tacts a, a''. to throw either
magnet A. B out of circuit,
substantially as set forth.

Thomas A. Edison

Paul Goepel

T. B. Mosher

2/

U.S. PATENT OFFICE,

Washington, D. C., April 30", 1873.

T. A. Edison

Care Munn & Co.,

Present

Please find below a Communication from the Examiner relative
to your app'n for patent for Duplex Telegraph, Case B, filed
April 21st 1873

72/63.

Very respectfully,

Commissioner.

EXAMINER'S ROOM, NO. 98

1094

This app'n has been examined and the app'n is rejected,
the 1st claim being anticipated by patent of G. Doyle Jan 31st 60
("Telegraphs), (this anticipates the claim as presented, the
real feature of novelty in the case not being brought out in
the claims). The 2^d is merely the circuit changing key shown
in Farmers Reissue of Dec 10th 1872 of patent of Nov 15th 1859
and in Stearns patents of May 14th & Nov 12th 1872.

Appt calls SL "a sounder lever" & SM "a sounder magnet,
but such are not the facts as they are represented and described.

Z. P. Wilber

Exr

"Case B"

Washington D. C.

May 15th 1873.

Hon. M. D. Leggett

Comm^r of Patents

Sir:

I hereby amend the specification in my application for Letters Patent for Duplex Telegraph Apparatus, filed April 21st 1873, by erasing all of specification except signatures and substituting;

"To all whom it may concern:

Be it known

That I, Thomas A. Edison, of Newark, in the County of Essex, and State of New Jersey, have invented a new and Improved Duplex Telegraph Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing forming a part of this specification.

My invention has for its object the simultaneous transmission of two signals over the same wire, but in

opposite directions, and consists of the combination of two electro magnets with their armature lever pivoted between them, and placed at different distances from the same, so as to prevent the electro magnets ~~to~~ responding to the signals transmitted from the home station, without being prevented from receiving the signals of the distant station.

The accompanying drawing represents a plan view of my improved apparatus for double transmission, in which A and B are the receiving magnets, L their armature lever, pivoted between them and adjusted at greater distance from magnet A than from magnet B, requiring therefore ^{greater} an increased amount of power to attract the same to A than the magnet B. The *Case of*
Transmit
Amk 13.
Feb. 4/73 magnet B is connected by wire m with contact stop a and spring contact b to the earth. An insulated extension a' of contact a serves also as back stop for the armature lever S L of the sending magnet which

reaches, when drawn to the magnet S, a second contact b' of spring contact b, disconnecting the stops a b and throwing relay B out of circuit. Magnet A is connected by wire m' with the line and also with the main battery M B to lever S L, operated by means of key K, battery S, B and magnet S.

By closing the lever S L, the same acts on contact b' separating contact a b and throwing magnet B out of circuit. The current of the main battery M, B passes through magnet A to the line. Magnet A is placed at such a distance from lever L, that the power of the main battery M B is insufficient to attract the same, the signals are therefore transmitted to the distant station without being responded to by the home station. If however, the lever S L be open, the main battery M, B and magnet A are thrown out of circuit and magnet B, being adjusted much closer to lever L, is placed by contacts a b in circuit, attracts lever L and responds to the

signals of the distant station. The line current is then conducted by contacts a b to the earth E.

When both stations are transmitting, so that lever S L is closed at each station, the combined strength of the main batteries, both of the home and distant station is passed ^{causing it to} through magnet A attracting the ^{has joined} armature lever L and responding thereby ^{per South C.} to the signals from the distant station. The joint power of both main batteries which are connected with opposite poles, is in this case sufficient to overcome the greater distance between A and L.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1st. The combination of armature lever L and electro magnets A and ^{has joined} B with each other, when the distance between A and L ^{being} is greater than that between B and L as and for the purpose described.

2^d The combination of the magnets A
B and lever L, which are relatively
placed as described with the operat-
ing lever S L, contact stops a b b and
insulated back stop a, all ar-
ranged as described".

Thomas A. Edison

per Munn & Co

Attorneys.

June 7th
U.S. PATENT OFFICE,

Washington, D. C., June 7th 1873.

T. A. Edison

Care Munn & Co.

Present

Please find below a Communication from the Examiner
relative to your app'n for patent for Duplex Telegraph
filed April 21st 1873

Case B

Very respectfully 72/63..

Commissioner.

EXAMINER'S ROOM, NO. 98

A few verbal amendments are needed in the amended
specification of this case, as noted in on the margin thereof,
Also in the claims

Z. E. Wilber

Exr

222

Case B.

Washington D. C.

October 4th 1873

Hon M. D. Leggett
Comm^r of Patents.

Sir:

I hereby amend
the specification in my application ("B")
for Letters Patent for Improvement
in a Duplex Telegraph filed April
21st 1873 by canceling "an increased amount
Am. & E. ~~and B~~"; and inserting - greater - 18" and 19"

Oct. 4/73 lines, page 2 of amended specification

Also by canceling "attracting", and

Am. & E. inserting - causing it to - 9th line, page

Oct. 4/73 ~~B~~; also inserting - respond - in place of
"responding", next line.

Also by canceling, "and B", in 1st claim

and inserting - B and their respective

Circuits. Also canceling "when", in 3d

line and inserting - being - in place of

"is", 4th line of claim.

Also by canceling the word "operating"

and inserting key before "lever" in

2^d claim. And inserting having-

before "contract" in said claim.

J. A. Edison

by Munn & Co

Attys

New York, Octo 15, 1873.

Hon M. D. Leggett
Comm^r of Patents

Sir

At the especial solicitation of Mr T. A. Edison I have consented to attend to the six Duplex Telegraph cases of his that were originally prepared by Messrs Munn & Co.

If the drawing in each case can be returned I shall be obliged and then the instructions of Mr E. can be taken as to the nature of each invention and entirely new specifications prepared.

Powers of atty. enclosed.

Respectfully yours.

Lemuel W. Serrell

Tabb

Case B.
1873.

72/53

No.

Thomas A. Edison.
Of Newark,
County of Essex,
State of New Jersey,
Duplex Telegraph Apparatus.

Rec'd April 21, 1873.

Petition " " "

Affidavit " " "

Specification " " "

/ Drawing " 22 "

Model " " "

Cert. dep.

/ Cash \$15. April 21, 1873.

Add'l Fee Cert.

" " Cash

Examined

Issue

Patented

Recorded vol.

Circular

ABANDONED.

, 18

page

Munn and Co.

Present.

U.S. PATENT OFFICE.
APPLICATION OF

T. A. Edison.

Filed Apl. 21, 1873.

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1873.

Rej., April 30th 1873

Letter June 5th "

gla
ma

2-389.

E 836

29 71

FOR IDENTIFICATION.



To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the
Records of this office of the File Wrapper
Contents and Drawing in the matter of the
Abandoned Application of
Thomas A. Edison
Filed April 29 1873
for
Improvement in Duplex Telegraph Apparatus

In testimony whereof I have hereunto set my hand and
caused the seal of the Patent Office to be affixed at
the City of Washington this 11th day
of April, in the year of our Lord
one thousand nine hundred and seven
and of the Independence of the United States of
America the one hundred and thirty first.

Edison
 Assistant Commissioner of Patents.

P E T I T I O N .

To the Commissioner of Patents of the United States of America:

The Petition of Thomas A. Edison of Newark in the County of Essex and state of New Jersey Respectfully Represents-- That your petitioner has invented a new and Improved Duplex Telegraph Apparatus which he verily believes has not been known or used prior to the invention thereof by your petitioner. He therefore prays that Letters Patent of the United States of America may be granted to him therefor, vesting in him and his legal representatives the exclusive right to the same, upon the terms and conditions expressed in the Act of Congress in that case made and provided; he having paid Fifteen Dollars into the Treasury of the United States, and otherwise complied with the requirements of said Act. And he hereby authorizes O. D. Munn and A. E. Beach, of the firm of MUNN & CO., of the Cities of New York and Washington, or their accredited Agents, to act as his Attorneys in presenting the application, and in making all such alterations and amendments as may be required, and to sign his name to the drawings.

Thomas. A. Edison

O A T H .

City & County of New York)
State of New York:) ss.

On this Twenty second day of April 1873, before the subscriber, A Notary Public in and for said County, personally appeared the above-named Thomas. A. Edison and made solemn Oath that he verily believes himself to be the original and first inventor of the within described Improved Duplex Telegraph Apparatus and that he does not know or believe that the same was ever before known or used; and that he is a citizen of the United States.

T. B. Mosher

Notary Public

(Notarial Seal)

Case. C.

Specification describing a
new and improved
"Duplex Telegraph Apparatus"
invented by Thomas A Edison
of Newark, in the County of
Essex and State of New Jersey

This invention relates to apparatus
for simultaneous transmission
of two dispatches or signals from
opposite ends over the same
line wire and consists in plac-
ing a shunt circuit around
the relay, which in connection
with an equating battery and ad-
justable rheostat neutralizes
the effect of the main battery
on the receiving instrument,
preventing it thereby, to respond
to the signals transmitted
from the home station without
preventing it to respond to the
signals from the distant sta-
tion.

The accompanying draw-
ing represents a plan view of

my improved apparatus for double transmission in which, A is the receiving relay L its armature lever, M, B, and M B' two main batteries of equal strength, but with opposing poles, the latter being connected to the earth at E. The equating Battery E, B, is placed in a shunt around the relay A with its current in opposite direction to that of the main battery M B, neutralizing thereby the effect of the same in relay A at the same moment, when the battery M B is put on the line. The resistance of the shunt, and the consequent increase and decrease of the equating battery E B is obtained ^{by} the adjustable Rheostat R, placed between the battery E B and the relay A. The other pole of the equating battery E B is connected to the spring contact a of sounder lever S L, which is operated in the usual manner in duplex

instruments by sounder battery
S B key R and sounder magnet
S. The sounder lever S L is plac-
ed by means of wires m m'
and contact stop d in circuit
with the opposing battery M B',
its insulated spring contact a,
connecting the shunt circuit
over contact stop b and wire
n.

When the home station is
not sending, so that the sound-
ing lever is open, the line
current passes through the
relay, attaching lever I and
thence to the earth at E. When
however the sounder lever S L
is closed, three different cir-
cuits are formed by spring
contacts a, b, and contact d, viz:
the circuit of the opposing
main battery M, B', over wire M,
sounder lever S L, contact d and
wire m, the shunt circuit
through rheostat R and relay
A and the main circuit from
battery M, B, through relay A
and line to the distant

station. In the circuit of the main battery M B, a slight resistance may be thrown in to prevent spark at contact d. The outgoing main current is rendered nugatory in its effect on the relay, by the neutralizing influence of the opposing current of the shunt battery. One part of the main current passes around the relay over the shunt to the line, and transmits thereby the signals to the distant station, the relay A being prevented to respond to them.

When, however, both stations are transmitting signals at the same time, the current from the distant station operates the relay A, the outgoing current, being neutralized in its effect thereon, working in similar manner the receiving instrument at the distant station.

Having thus described
my invention

I claim as new
and desire to secure by Let-
ters Patent

First, In apparatus for double
transmission, the combina-
tion of the receiving instrument
with a shunt circuit and
equating battery, to neutralize
effect of outgoing current sub-
stantially as described.

Second, the sounder lever S L
having spring contact a in
connection with contacts d and
b, to close circuit of opposing
main battery M B and shunt
circuit, substantially as and
for the purpose described

Thomas A. Edison

Witnesses

T.B. Mosher

Alex F. Roberts

"Case C"

Washington D. C.

May 15th 1873.

Hon M. D. Leggett

Commr of Patente

Sir:

I hereby amend the specification in my application for Letters Patent for Duplex Telegraph Apparatus, filed April 21st 1873, by erasing all of specification except signature and substituting;

"To all whom it may concern:

Be it known

that I, Thomas A. Edison, of Newark, in the County of Essex, and State of New Jersey, have invented a new and Improved Duplex Telegraph Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification.

This invention relates to apparatus for simultaneous transmission of

two dispatches or signals from opposite ends over the same line wire, and consists in placing a shunt circuit around the relay, which, in connection with an equating battery and adjustable rheostat neutralizes the effect of the main battery on the receiving instrument, preventing it thereby from responding to the signals transmitted from the home station without preventing it from responding to the signals from the distant station.

The accompanying drawing represents a plan view of my improved apparatus for double transmission.

A is the receiving relay, L its armature lever, M, B, and M, B' two main batteries of equal strength, but with opposing poles, the battery M B' being connected to the earth at E. The equating battery E B is placed in a shunt around the relay A with its current in opposite direction to that of the main battery M, B, neutralizing thereby the effect of the same in relay A, at the same

moment when the battery M B is put on the line. The resistance of the shunt and the consequent increase and decrease of the strength of the current for equating battery E B is obtained by *Amth. B.* the adjustable rheostat R, placed *Oct. 11/73* between battery E B and the relay A.

The other pole of the equating battery E B is connected to the spring contact a of armature lever S L, which is operated in the usual manner in duplex instruments by battery S B, key K, and sending magnet S. The lever S L is placed by means of wires m m' and contact stop d in circuit with the opposing battery M B', its insulated spring contact a, connecting the shunt circuit to contact *Amth. B.* stop b and wire n. *Oct. 11/73.*

When the home station is not sending, so that the armature lever S L is open, the line current passes through the relay, attracting lever L and thence to the earth at E. When however, the lever S L is closed, three different circuits are formed by spring contacts a b and contact d; the

shunt
circuit of the opposing main battery
M B' over wire m', lever S L, contact

d and wire m; the shunt circuit
through rheostat R, relay A, wire n,

Case 4d
insert for stop b, spring contact a, and the
main circuit from battery M B

Amend 2 through relay A and line to the
Oct. 11/73 distant station. In the circuit of

the main battery M B' a slight re-
sistance may be thrown in to pre-
vent spark at contact d. The

outgoing main current is rendered

Case 4d nugatory in its effect on the relay A
insert for of the home station by the neutralizing

Amend E influence of the opposing current of
Oct. 11/73 the shunt battery.

One part of the current of main
battery M B passes to the relay A, where
it is opposed and neutralized by
of battery E B,
the shunt current, while the other
part of such main current passes
along the wire n, stops b a, battery
E B and rheostat R to the line and
transmits thereby the signals to the
distant station, the relay A at the
home station being prevented to res-

Case 4d responding to them and the resistance
per Amend 7.
Oct. 11/73.

of rheostat R being taken up by the shunt circuit so as not injuriously to affect such line current. When however, both stations are transmitting signals at the same time, the current from the distant station operates the relay A, the outgoing current being neutralized in its effect thereon, working in

same and similar manner the receiving instrument at the distant station.

Amst. J. It will be observed, that in putting
Oct. 11 '72 in the line the two main batteries

M B and M B' of equal strength with their poles opposing each other, the main battery M B is allowed to operate by the short circuiting or shunting of the other battery M B', such shunting taking place through a slight resistance, and that, as long as main battery M B' has no current, it also prevents battery M B from having a current and the consequent useless absorption of power.

Having thus described my in-

vention, what I claim as new and
desire to secure by Letters Patent is:

1st The combination of the opposing
-main batteries M B and M B' with
each other and the equating or
shunt battery E B and adjustable
rheostat R, for simultaneous action
as described.

*Revised and
inserted for
Sept. 4
Oct. 11/95.*

2d The relay A, placed within the
shunt circuit and branch of the
current of the main battery M B, and
arranged in combination with the
lever S L and battery E, as set forth".

Thomas A. Edison

per Munn & Co

Attorneys.

(No.1.)

June 9th.

U. S. Patent Office,

Washington, D.C., June 6th, 1873.

T. A. Edison

Cars Munn & Co

Present

Please find below a Communication from the Examiner relative to your app'n for patent for Duplex Telegraph, Case C, filed April 26th 1873

Very respectfully,

74/104

Commissioner.

Examiner's Room, No. 98

In the amended specification filed in this case there are some inaccuracies requiring attention. On p 3 a decrease & increase of the strength of a battery is spoken of as consequent upon a resistance, such is not the case, the strength of the battery remains the same. On p 4, 3^d & 4th lines what is the shunt-circuit-spoken-of-a-circuit-of-what? Moreover the Relay relay A is spoken of as in a shunt circuit, circuit of what? A however is not in a shunt and can't be from the very definition of a shunt. On same page a shunt battery and a shunt current are spoken of, what are they?

What is meant by the conclusion of the ^{last} paragraph on p 4, commencing "and the resistances" down to "When however" p 5. As to in the paragraph commencing "When however" p 5 how & why does current from distant station neutralize current from home station in relay A. -- The next (last before claims) paragraph is likewise devoid of clearness, an explanation of what is meant and of the "how" of what is done, is requested

The claims are rejected, the 1st for the reason that as described M B' is a useless addition to the device having no function and performing no office, an explanation should be given touching these points, and also setting forth the circuits when key S L is open.

The 2^d claim for the reason that relay is not in a shunt circuit, and that there appears to be no combination with S, L.

Z. F. Wilber

Exr

"Case C"

Washington D. C.

October 9th 1873.

Hon. M. D. Leggett

Comar of Patents

Sir:

I hereby amend the specification in my application for Letters Patent for Duplex Telegraph Apparatus, filed April 29th 1873, by canceling that part of recital of invention on page 2, following line 2, and inserting;

--and consists in combining two opposing batteries (one of which may be shunted) and an

Amend A.
Oct. 11/73. equating battery and rheostat with a relay so as to prevent the said relay from responding to the signals of the home station but allow it to respond to the signals of the distant station.

Also by canceling lines 3 to 7, inclusive, page 3, and inserting;

---and

Amend A. the consequent effect of the same
Oct. 11/73. in determining the course of the electrical currents, is regulated by

Amolt R the rheostat R, which is made
Oct. 11/73, adjustable in any of the well
known ways.---

Amolt C Also by inserting ~~---(but not to m)---~~,
Oct. 11/73 after "n", 9th line from bottom
of page 3.

Also by canceling words between
"the"
m ^ 3d line, and "station", 8th line
page 4 and inserting;

--the circuit

of the main battery M B through
Amolt D, wire m, stops d and b, lever S, L,
Oct. 11/73, and wire n; and also the main
or line circuit through battery M
B, magnet A and the line to
distant station--

Also by canceling lines 12 to 17
inclusive page 4 and inserting;

--effect

of the outgoing main current on
Amolt E, the relay A of the home station
neutralized,
Oct. 11/73, is, for the reason that the cur-
rent from the opposing or like
pole of the equating battery E B

meets said main current in the
helix of the relay.

Say that the force of each battery
is represented by 4, and the re-
Amst E sistance of the rheostat R by 2;
Oct. 11/73. then it is evident the neutralizing
power of the 'battery' E B on the battery
M B will be equal to 2, which leaves
half the force of the latter available
for transmission to distant sta-
tion. Thus one part of the cur-
rent of the main--

Also by canceling last line page
4, and all of page 5 and inserting;

--pending to them, the resistance
of rheostat R being compensated
for or overcome by the power of
the equating battery E B.

Amst F. When both stations are trans-
Oct. 11/73. mitting signals, at the same time,
the battery M B' of each will be
shunted by the circuit formed
through m', lever S L, stop d, and
wire m, leaving the main battery
M B of each station to combine

its power with the other (at the other station) to operate the respective relays A, its connection with its relay being through the wire o and wire n, spring a, battery B B, Rheostat R, and wire p.

Thus the function of the battery *Amend 7.* M B' is supplemental; first, in that *Oct. 11/73.* it neutralizes the effect of the main battery M B (by opposing polarity) when the lever S L is open and the home station is not transmitting which leaves the relay A free to respond to the signals of the distant station; and second, in that when the lever S L is closed, it (M B') is shunted, and leaves the main battery M B free to act in transmission of signals to the distant station--

Also by canceling claims and inserting;

Amend 4. "1st The combination of the batteries *Oct. 11/73.* M B and M B' one of which may be shunted, with relay A, equating

battery E B, rheostat R, and suitable
accessory connections for operating
as specified.

*Amtd J.
Oct-11/73.*

2d The main battery M B and
equating battery E B in combination
with the relay A & rheostat R, all
connected by the means shown
and described".

Thomas A. Edison
per Munn & Co
Attorneys.

New York Oct. 15th 1873

Sir:

I hereby appoint Lemuel W. Serrell, New York, my agent and Attorney, in relation to my application for a patent on Duplex Telegraphe, revoking all previous authority and authorize him, or his substitute, to do whatever may be necessary in the premises, as fully and entirely as I could do if personally present, and to receive the Patent when granted.

Respectfully Yours,

Hon. M. D. Leggett

Thomas A Edison

Commissioner of Patents.

OFFICE FOR PATENTS,

119 & 121 NASSAU STREET, NEW YORK,

Oct. 15th 1873

The correspondence on this case, and also the Patent, when granted, you will please address to my care. Oblige by returning the drawing

Respectfully Yours,

Hon. M. D. Leggett

LEMUEL W. SERRELL.

Commissioner of Patents.

(N5.1.)

1.

U. S. Patent Office,
Washington, D. C., April 30th, 1873.

T. A. Edison
Care Munn & Co
Present

Please find below a Communication from the Examiner
relative to your app'n for patent for Duplex Telegraph,
Case C, filed April 29th 1873.

74/104

Very respectfully,

Commissioner.

Examiner's Room, No. 98

This app'n has been examined and a patent is refused.

In the first place there is no sufficient description of
the combination and operation of the devices and circuits,
nothing explaining clearly the duplex operation. As
described the battery M, B', seems to be entirely superfluous.
A sounder lever, magnet and battery are spoken of but the de-
vices referred to are not such.

As to the 1st claim, a shunt circuit & equating battery
around or which circuit
are claimed but for what the circuit is shunted is not stated.
In terms the claim however is anticipated by patent of John C.
Wilson March 4th 1873

The 2^d claim is also anticipated by same patent.

Z. F. Wilber

Exr

74/104

U. S. PATENT OFFICE.

APPLICATION OF

Thos. A. Edison

Filed April 26, 1873

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1873.

Miller
74/104

No.

Thomas A. Edison,

Of Newark
County of Essex
State of New Jersey.

Duplex Telegraph Apparatus

Rec'd	April 26, 1873.
Petition	" " "
Affidavit	" " "
Specification	" " "
/ Drawing	" 29 "
Model	" 26, "

Cert. dep.

/ Cash \$15.

April, 24, 1873,

Add'l Fee Cert.

" " Cash

Examined

Issue

/ Patented

Recorded vol.

Circular

ABANDONED.
18 ,
page

Munn and Co,

Present,

Lemuel W. Serrell

New York City

1873.

Rej ^d	April	30 th	1873
Letter	June	6 th	"

O. W.
M. H. A.

UNITED STATES OF AMERICA
Department of the Interior,
PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the
Records of this office of the *File* *Serial*
Contents and Drawing in the matter of the
Abandoned Application of
Thomas A. Edison
Filed April 22, 1873
for
Improvement in Duplex Telegraph Apparatus

In testimony whereof I have hereunto set my hand and
caused the seal of the Patent Office to be affixed at
the City of Washington this *11th* day
of *April*, in the year of our Lord
one thousand nine hundred and *eighty*
and of the Independence of the United States of
America the one hundred and *thirty* first.

E. M. Smith
Assistant
Commissioner of Patents.

P.G.

Case "D"

P E T I T I O N .

To the Commissioner of Patents of the United States of America:

The Petition of Thomas A. Edison of Newark in the
County of Essex and State of New Jersey

Respectfully Represents -

That your petitioner has invented a new and Improved
Duplex Telegraph Apparatus which he verily believes has
not been known or used prior to the invention thereof
by your petitioner. He therefore prays that Letters
Patent of the United States of America may be granted to
himtherefor, vesting in him and his legal representatives
the exclusive right to the same, upon the terms and condi-
tions expressed in the Act of Congress in that case made
and provided; he having paid Fifteen Dollars into the
Treasury of the United States, and otherwise complied
with the requirements of said Act. And he hereby authorizes
O. D. Munn and A. E. Beach of the firm of MUNN & CO., of
the Cities of New York and Washington, or their accredited
Agents, to act as his Attorneys in presenting the applica-
tion, and in making all such alterations and amendments
as may be required, and to sign his name to the drawings.

Thomas A. Edison

O A T H .

City & County of New York }
State of New York } ss.

On this Sixteenth day of April 1873, before the subscriber, A Notary Public, in and for said County, personally appeared the above-named Thomas A. Edison and made solemn OATH that he verily believes himself to be the original and first inventor of the within described Improved Duplex Telegraph Apparatus and that he does not know or believe that the same was ever known or used; and that he is a citizen of the United States.

T. B. Mosher

Notary Public.

(Notarial Seal)

-Case D -

Specification describing

a new and Improved
Duplex Telegraph Apparatus
invented by Thomas A. Edison
of Newark in the County
of Essex and State of New
Jersey.

This invention

relates to apparatus for
simultaneous transmission
of two dispatches or signals
over the same line wire
in opposite directions and
consists in the neutraliz-
ing of the effect of the
out going current on the
receiving instrument by
an adjustable opposing
operated
magnet, by a local battery
so that the relay is pre-
vented from responding to
the signals of the home
station. It also consists in
the arrangement of an in-
duction magnet in connec-
tion with the local battery
and the main line, for

neutralizing the static current of the line.

In the accompanying drawing

Figure 1 - represents a plan view of my improved apparatus for double transmission, and

Figure 2 - is a side elevation partly in section, of the relay and the opposing local magnet.

Similar letters of reference indicate corresponding parts.

A represents the receiving magnet, the cores a of which are provided with projecting pieces a' placed sideways of the axis of the cores towards each other, requiring a smaller armature, of lever L. The local magnet B having projecting cores b, is placed against the magnet A, with opposing poles, the N and S poles of the local magnet

respectively. The lever L, with its armature is working between the forward projecting cores of the magnet B. The local magnet B is connected by guide rods d and d' with pillar e and made adjustable towards magnet A by means of spiral spring f and thumb screw g. The magnet B may thereby be adjusted so as to exactly neutralize the effect of the outgoing current of the main battery on lever L. The local magnet B is operated by the local battery L.B. placed by contact h in connection with spring contact h' of sounder lever S L which is again operated in the usual manner by sounder battery L B. Key K and magnet S. The local battery may be dispensed with and a secondary current sent from the

main battery be made in the usual manner. The main battery connects by wire m to the relay A and the line and by wire n to the sounder lever which is placed by contact stop i through rheostat R in a shunt circuit with the carbon poles of the main and neutralizing batteries M B and M B', the latter being connected to the earth E. C is an induction magnet, having one coil D in the same local circuit, the other coil F in circuit with the main line.

On operating the apparatus, the out going current of the main battery M B, on closing sounder lever S L, is divided, one portion passing through relay A to the line, the other through contacts i and rheostat R to battery M B and the earth.

Rheostat R is of slight resistance, to prevent too much spark on contact, point i. The local circuit is connected at the same time by contacts h h' and thereby the effect of the outgoing current upon the cores, a, of the relay neutralized by the opposite polarities of the cores b of the local magnet B. The current passes therefore to the distant station, without effecting the lever L, as the sounder lever closes the local circuit, at the moment the main battery is thrown on the line.

When the sounder lever S L is open the armature lever L responds to the current of the distant station, as no opposing polarity of the local magnet prevents its attraction.

When the sounder levers are closed at both stations,

the current of the main battery at the home station is neutralized by the local magnet, but the current of the distant station, being of equal polarity with it, attracts the lever L and responds thereby to the signals of the distant station.

The static current of the line is neutralized at the moment of closing and opening the sounder lever S L. When the sounder lever is closed the induction coil D of the local battery is acting upon the iron core C, which induces a momentary current into F and upon the line opposite to and of equal duration with the static current thereby neutralizing each other. At the moment of opening the sounder lever, the static current

is at opposite polarity
and is then neutralized
by the induction current
of coil F, which is also in
opposite direction. The
amount of induction
electricity can be regulated
by means of a rheostat
shunt around the magnet D.

Having thus described
my Invention- what I claim
as new and desire to secure by
Letters Patent is

First - In apparatus for
double transmission, the receiv-
ing instrument A, having inside
projecting cores a in combina-
tion with the opposing magnet B
having projecting cores b, adjustable
towards ^{the former} and operated substantially
as for the purpose described.

Second - The induction magnet
C, having coils D and F placed
in the local battery L B and
the main line, to neutralize
the static current on the
same, substantially as and
for the purpose described.

Thomas A Edison

Witnesses

Paul Geepel.

Alex F. Roberts

2.

U.S. Patent Office,
Washington, D. C. April 30, 1873.

T. A. Edison
Care Munn & Co.
Present

Please find below Communication from the Examiner
relative to your appl'n for patent for Duplex Apparatus,
Case D filed April 22nd 1873

Very respectfully,

Commissioner.

Examiner's Room, No. 98

This appl'n has been examined and, it is found that the
specification is objectionable in that it does not
clearly explain and show how the devices act as a duplex
telegraph.

As to the claims, the 1st is substantially anticipated
by forfeited appl'n of Hill and Haskins ^{filed} Novr 17 1871 - The
2d is meaningless as presented, in substance it is substan-
tially anticipated by patents of J. B. Stearns May 14th
1872 & March 18th 1872 (136,873)

A patent is accordingly refused.

Z. F. Wilber

1141

Washington, D. C.

May 23d, 1873.

Hon. W. S. Leggett

Commr. of Patents

Sir:

I hereby amend the specification in any application for Letters Patent for Duplex Telegraph Apparatus, (baseD) filed April 22d 1873, by erasing all of specification except signatures and substituting;

To all whom it may concern:

Be it known

that I, Thomas A. Edison, of Newark, in the County of Essex, and State of New Jersey, have invented a new and Improved Duplex Telegraph Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this Specification.

This invention relates to apparatus for simultaneous transmission of two dispatches or signals over the

same line wire in opposite directions, and consists in the neutralizing of the effect of the outgoing current on the receiving instrument of the home station by an adjustable opposing magnet, operated by a local battery, so that the relay is prevented from responding to the signals of the home station. It also consists in the arrangement of an induction magnet in connection with the local battery and the main line, for neutralizing the static current of the line.

In the drawing-

Figure 1 represents a plan view of my improved apparatus for double transmission, and

Figure 2 is a side elevation, partly in section, of the relay and the opposing local magnet.

A. represents the receiving magnet, the cores a of which are provided with projecting pieces a' placed side-

ways of and between the two axes of the cores thus requiring a smaller armature for lever L. A local magnet B having projecting cores b, is placed against magnet A, with opposing poles, the North and South poles of the receiving magnet opposite the South and North poles of the local magnet, respectively.

The lever L with its armature a works between the cores of magnet B, as indicated in Fig. 2. The local magnet B is connected by guide rods d and d' with pillars e and made adjustable towards magnet A by means of spiral spring f and thumb-screw g. The magnet B may thereby be adjusted so as to exactly neutralize the effect of the outgoing current of the home main battery on lever L. The local magnet B is operated by the local battery L B placed by contact h in connection with spring contact h' of armature lever S L, which is again operated in the usual manner by the battery L B, key K and magnet G. The local battery may be dispensed with and a secondary current from

the main battery made in the usual manner.

supplemental M B'
The main battery connects by wire m to the relay A and the line and branch by wire n to the sounder lever which latter is placed by contact stop i through rheostat R in a shunt circuit with the carbon poles of the main and neutralizing batteries M B and M B', the latter being connected to the earth E.

C is an induction magnet, having one coil D in the local circuit, the other coil F in circuit with the main line. On operating the apparatus, the outgoing current of the main battery M B on closing lever S L is divided, one portion passing through relay A to the line, the other through contact i and rheostat R to battery M B' and the earth.

Rheostat R is of slight resistance to prevent too much spark on contact point i. The local circuit is connected at the same time by contacts h h' and thereby the effect of the outgoing current upon the

cores of the relay neutralized by the opposite polarities of the cores b of the local magnet B.

The current passes therefore to the distant station, without affecting the lever L, as the sounder lever closes the local circuit at the moment the main battery is thrown on the line. When the sounder lever S L is open the armature lever L responds to the current of the distant station, as so opposing polarity of the local magnet prevents its attraction. When the sounder levers are closed at both stations, the current of the main battery at the home station would be neutralized by the local magnet, but the current of the distant station, adding an equal degree of power to the current of the main battery M B, so that the magnet A with by its additional strength overcomes the resistance of the opposing magnet B, and lever L responds, thereby to the signals of the distant station.

For neutralizing the static current

of the line at the moment of closing and opening the lever S L, the local and main lines are connected to the coils D and F respectively. When the lever S.L is closed, the induction coil D of the local circuit is acting upon the iron core C, which induces a momentary current in F and upon the line opposite to and of equal duration with the static current; thereby neutralizing the same. At the moment of opening the lever S L, the static current of the line is ^{in an} ~~at~~ opposite direction, ~~as the~~ ~~former~~ and is ^{then} ~~then~~ neutralized again by the induction current of coil F, which is also in opposite direction. The amount of inductive electricity can be regulated by means of a rheostat ^{placed in a} shunt around the coil D.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

- 1st. The combination of the receiving

magnet A, having the projecting pieces a' between the axes of its cores, with the adjustable opposing magnet B of the local circuit and with the operating lever L, substantially as specified.

2d. The induction magnet C, carrying the coils D and F, which are respectfully placed in the local and main circuit, for neutralizing the static current, substantially as set forth."

Thomas A. Edison

per Munn & Co.

Attorneys.

10.

U.S. Patent Office,
Washington D.C. June 7", 1873

T. A. Edison
Care Munn & Co
Present

Please find below a Communication from the Examiner
relative to your appl'n for patent, for Duplex Telegraph
filed April 21" 1873

Case D 72/04

Very respectfully,

Commissioner.

Examiner's Room No. 98

As amended this appl'n has been re-examined and it is
found that the new specification filed needs correction
in some particulars.

On last line of p 2 a "secondary current" is spoken
of, which ^{term} ~~ex-electric~~ is usually taken as synonymous with
"induced current", is not a "branch circuit" what is meant?
The 1st paragraph of page 4 is unintelligible. In the next
paragraph is there not a mistake in the description of the
circuit of M.B. wherein a part of the current thereof is
described as going through n, S L, i, R, M.B' to earth.
It certainly is not so shown in the drawing.

The meaning of the last sentence on p 5 (commencing
"When the sounder levers") is obscure from the faulty con-
struction. The object of the sentence is to show how the
current of M. B. is reinforced by the current of the

447

battery at distant station. To do this it will be necessary to give a description of the arrangement of the batteries at each end and of their circuits in the varying positions of the keys or circuit breakers.

On p 6 D is spoken of as the induction coil, from the drawing D would appear to be the primary coil, ^{thereof} The description of the coil on p 4 is faulty in not clearly describing the coil and stating which are the primary & secondary helices.

What is meant by a "rheostat shunt", spoken of in sentence just before claims?

Attention is called to the fact that the ^{armature} lever Key S.L is spoken of in several places as a "Sounder lever".

As presented the claims are substantially those before rejected and are again rejected on some references. See also J. E. Stearns patent of June 2d 68 (78548). Appt's differential relay differs slightly from that of Stearns and Hill & Haskins, but the combinations are identical

Z. F. Wilber

Ex.

New York October 15, 1873

Sir:

I hereby appoint Lemuel W. Serrell, New York, my agent and Attorney, in relation to my application for a patent on Duplex Telegraphs, revoking all previous authority and authorize him, or his substitute, to do whatever may be necessary in the premises, as fully and entirely as I could do if personally present, and to receive the Patent when granted.

Respectfully Yours,

Thos A. Edison.

Hon. M. D. Leggett

Commissioner of Patents.

OFFICE FOR PATENTS,

119 & 121 Nassau Street, New York.

Octo 15 1873

The correspondence on this case, and also the Patent, when granted, you will please address to my care. Oblige by returning the drawing.

Respectfully Yours,

LEMUEL W. SERRELL.

Hon. M. D. Leggett.

Commissioner of Patents.

U.S. PATENT OFFICE.

APPLICATION OF

T. A. Edison,

Filed Apl. 21, 1873.

Contents of this File.

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Case D.

Wilbur

1873.

72/
64

No.

Thomas A. Edison,

Of Newark.

County of Essex,

State of New Jersey.

Duplex Telegraph Apparatus.

Rec'd April 21 , 1873.

Petition " " "

Affidavit " " "

Specification " " "

/Drawing " 22 "

Model " " "

Cert. Dep.

/Cash \$15 April 21 , 1873

Add'l Fee Cert.

" " Cash

Examined

2 Issue

4 Patented 18 ,

Recorded vol. page

Circular

ABANDONED.

Munn and Co,

Present.

Lemuel W. Serrell

New York City

1873.

Rej^d April 30" 1873

" June 7" "

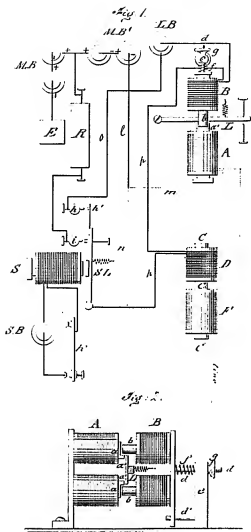
*Action suspended by
Atty's request*

*SLA
mmd*

LIBRARY.
Telegraph.

Case D

27/6



Witnesses:

Engs. Nida
E. Stedman

Inventor:

P. A. C. C. C.

Per

Wm. M. C.

Attorneys.

Reg. apt 30. 75.

Cal 69

FOR IDENTIFICATION.



To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the
Records of this office of the File Wrapper
Contents and Drawing in the matter of the
Abandoned Application of
Thomas A. Edison
Filed April 22, 1879
for
Improvement in Multiplex Telegraph Apparatus.

In testimony whereof I have hereunto set my hand and
 caused the seal of the Patent Office to be affixed at
 the City of Washington this 11th day
 of April, in the year of our Lord
 one thousand nine hundred and seven
 and of the Independence of the United States of
 America the one hundred and thirty-first.

E. P. Johnson
 Assistant Commissioner of Patents.

P.G. \$15-74

Case "B"

P E T I T I O N .

To the Commissioner of Patents of the United States of America:

The Petition of Thomas A. Edison of Newark in the County of Essex and State of New Jersey Respectfully Represents--- That your petitioner has invented a new and Improved Duplex Telegraph Apparatus which he verily believes has not been known or used prior to the invention thereof by your petitioner. He therefore prays that Letters Patent of the United States of America may be granted to him therefor, vesting in him and his legal representatives the exclusive right to the same, upon the terms and conditions expressed in the Act of Congress in that case made and provided; he having paid Fifteen Dollars into the Treasury of the United States, and otherwise complied with the requirements of said Act. And he hereby authorizes O. D. Munn and A. E. Beach, of the firm of MUNN & CO., of the Cities of New York and Washington, or their accredited Agents, to act as his Attorneys in presenting the application, and in making all such alterations and amendments as may be required, and to sign his name to the drawings.

Thomas A. Edison

O A T H .

City & County of New York }
State of New York } ss.

On this Sixteenth day of April 1873, before the subscriber, A Notary Public in and for said County, personally appeared the above-named Thomas A. Edison and made solemn Oath that he verily believes himself to be the original and first inventor of the within described Improved Duplex Telegraph Apparatus and that he does not know or believe that the same was ever before known or used; and that he is a citizen of the United States.

T. E. Mosher

Notary Public

(Notarial Seal)

Case "E"

Specification - describing
a new and Improved

Duplex Telegraph Apparatus:
invented by Thomas A. Edison
of Newark, in the County
of Essex, and State of
New Jersey.-

My invention relates
to apparatus for transmitting
dispatches or signals simulta-
neously over the same line
wire in opposite directions
and consists of the neutral-
ization of the effect of the
out going current by ^{the} main
batteries themselves, which are
connected with same poles
to both sides of the relay,
the other poles being con-
nected to the sounder lever
and thence to the earth.

The accompanying
drawing represents a plan
view of my improved ap-
paratus for double trans-
mission in which

A, represents the

receiving instrument or relay,
L, its armature lever and
M, B, two main batteries
of equal strength, arranged
at both sides of the
relay in such a manner
that the zink pole of one
main battery is connected
to one side of the relay,
and the zink pole of
main battery to the other
the other side of the
same. The carbon poles
of both main batteries M, B,
are connected to the sounder
lever S L, which is operated
in the usual manner,
by its key K, sounder
battery S, B, and magnet S,
Both zink poles of the
main batteries are connected
to the relay A, through
rheostats R, and R' adjusted
with slight resistance to pre-
vent shunting or short cir-
cuiting of the relay A.
A third rheostat R², is placed
between the relay A, and
the earth plate E- The

contact stop a, of the
sounder lever S L, is also
connected with the earth.

On closing the sounder
lever S, L by the depression
of key K, the carbon cur-
rent is rounded through
contact a, to the earth,
the zink currents of both
main batteries, pass through
the relay A, to the line,
but acting against each
other, neutralize their effect
on the relay A. The circuit
with the main battery at
the distant station is there-
by closed, and the signals
are transmitted over the line,
without affecting the armature
of the relay. When the
sounder lever is open, the
signals from the distant
station pass through the
relay A, and the rheostat
R², to the earth. The lever
L, responds to them as the
two main batteries being in
a shunt around the relay

and opposing each other, produce no effect on the same.-

When, however, both sounder levers are simultaneously closed at the home and distant station, the relay R, responds in similar manner to the current from the distant station, and the relay of the distant station to the outgoing zinc current of the home batteries so that thereby two signals are transmitted at the same time, one from either station.-

Having thus described
my invention.

I claim as new
and desire to secure by
Letters Patent -

1st The receiving
relay, in duplex telegraph
apparatus, combined with the
same poles of two main
batteries, to neutralize effect
of outgoing current on the
relay, substantially as set
forth.-

2nd The rheostats
R R', placed within the
circuits of the opposing
main batteries for the pur-
pose described.-

Thomas. A. Edison

Witnesses

Paul Goepel.

Alex F. Roberts

(No.1.)

3.

U. S. Patent Office,

Washington, D. C., May 2d 1873.

T. A. Edison

Care Munn & Co

Present

Please find below a Communication from the Examiner
relative to your app'n for patent for Duplex Telegraph
Case E, filed April 22d 1873

72/65

Very respectfully,

Commissioner.

Examiner's Room, No. 98

This app'n has been considered and the examination upon
its merits postponed for the reason the reason that as the case
is presented it is impossible to see how understand how
it operates as a duplex telegraph.

Z. F. Wilber

31

Bxr

Washington D. C.

May 22d 1873.

Hon M. D. Leggett

Comm^r of patents

Sir:

I hereby amend the specification in my application for Letters Patent for Duplex Telegraph Apparatus, (case E) filed April 22d 1873, by erasing all of specification except signatures and substituting;

"To all whom it may concern:

Be it known

that I, Thomas A. Edison, of Newark, in the County of Essex, and State of New Jersey, have invented a new and Improved Duplex Telegraph Apparatus; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to an apparatus for transmitting dispatches or signals simultaneously over the same line

wire in opposite directions, and con-
^{clude}
sists, in connecting the receiving magnet
with the equal poles of two main bat-
teries at each station for the neutraliza-
tion of the effect of the outgoing current
by such main batteries, whose other
poles ^{are} being connected to the armature
lever of the sending magnet and thence
to the earth.

The accompanying drawing represents
a plan view of any improved ap-
paratus for double transmission.

A represents the receiving instrument
or relay, L its armature lever and M B
two main batteries of equal strength
having their zinc ^{or negative} poles connected with
opposite ends of the electro magnet A
in such a manner that in A their
same currents will neutralize each other.
^{or positive}
The carbon poles of both main bat-
teries M B are connected with each other
and with the armature lever S L of the
sending magnet which is operated
in the usual manner by its key
K, battery S B and magnet S.

Both ~~zinc~~^{magnet} poles of the main batteries are
preferably connected to the magnet A
through rheostats R and R' adjusted
with slight resistance, to prevent shunting
or short circuiting of the magnet A.
A third rheostat R² is placed be-
tween the relay A and the earthplate
E. The contact stop a of the lever
S L is also connected with the earth E.

On closing the lever S L by the de-
pression of the key K, the carbon currents
of the main batteries are rounded through
contact a to the earth, the zinc cur-
rents of both main batteries pass through
the magnet A to the line, but acting
against other in A, neutralize their
effect on the relay A. The circuit with
the main batteries at the distant
station is thereby closed and the
signals are transmitted over the
line, without affecting the armature
of the home instrument A. When the
lever S L is open the signals from the
distant station pass through the relay
A and the rheostat R² to the earth.
The lever L responds to these signals,
as the two home main batteries, being

on a shunt around the relay and opposing each other, produce no effect on the same.

When, however, both levers S L are simultaneously closed at the home and distant station, both relays A respond, because the two batteries that connect directly with rheostat R and thence with opposite ends of the line, are then thrown in circuit and overcome by their joint action the opposing effects of the then remaining partial home batteries, to which they are joined.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1st The combination in one instrument of two main batteries whose equal poles connect with the receiving magnet A, while their remaining poles are joined together and to the lever S L, as and for the purpose set forth.

2^d The rheostats R, R', R², combined with the two main batteries and with the magnet A and lever S L, when the main batteries of both stations connect with the said magnet, as set forth".

Thomas A. Edison

per Munn & Co

Attorneys.

(No.1.)

June 10th

U. S. Patent Office,

Washington, D.C., June 7th, 1873.

T. A. Edison

Care Munn & Co

Present

Please find below a Communication from the Examiner relative to your appn for patent for Duplex Telegraph, filed April 21st 1873

Case E

72/65

Very respectfully,

Commissioner.

Examiner's Room, No. 98

The amended specification filed does not show clearly how appt's devices will act as a duplex telegraph.

There should be a description of the arrangement of the batteries and of their circuits, starting uniformly from one pole, say +, and proceeding to the other in all the varying positions of the keys viz when distant station is transmitting & home station idle and vice versa and when both stations are transmitting. As other batteries than zinc & Carbon may be used it would be well to use the \pm terms positive and negative to denote polarity of currents.

The specification speaks in several places of "zinc currents" and "Carbon currents flowing, one in one direction, ^{the} another in another direction simultaneously, giving the idea that there are two currents, this should be corrected. The relative resistances of R, R', R² to the line, to the relays &c & to each other should

be set forth, for upon this relation in a great measure hinges the question as to whether there will current from distant station will go through A and whether the current of M B will be sent over line to distant station instead of taking a short circuit through R, A, R^2 and S L when S L is closed.

As presented, lacking such explanation, the 2d claim is for an apparently inoperative combination and therefore rejected.

The 1st claim is likewise rejected as the devices there grouped do can accomplish nothing and moreover can be in combination only through certain other devices.

Z. F. Wilber

Exr

New York Octo. 15th 1873

Sir:

I hereby appoint Lemuel W. Serrell, New York, my agent and Attorney, in relation to my application for a patent on Duplex Telegraphs, revoking all previous authority and authorize him, or his substitute, to do whatever may be necessary in the premises, as fully and entirely as I could do if personally present, and to receive the Patent when granted.

Respectfully Yours,

Thos A Edison

Hon. M. D. Leggett

Commissioner of Patents.

OFFICE FOR PATENTS,

119 & 121 NASSAU STREET, NEW YORK,

Octo. 15th 1873

The correspondence on this case, and also the Patent, when granted, you will please address to my care. Oblige by returning the drawing

Respectfully Yours,

LEMUEL W. SERRELL.

Hon. M. D. Leggett

Commissioner of Patents.

U.S. PATENT OFFICE.

APPLICATION OF

T. A. Edison,

Filed Apl 21, 1873.

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Willson

Case E.

1 8 7 3.

72/65

No.

Thomas A. Edison.

Of Newark,

County of Essex.

State of New Jersey.

Duplex Telegraph Apparatus

Rec'd April 21, 1873.

Petition " " "

Affidavit " " "

Specification " " "

Drawing " 22 "

Model " " "

Cert. dep.

Cash \$15 April 21, 1873.

Add'l Fee Cert.

" " Cash

Examined

Issue

Patented , 18 ,

Recorded vol. page

Circular

Munn-and-Co.

Present

Lemuel W. Serrell

New York City

ABANDONED.

1873.

Letter

May 2d 1873

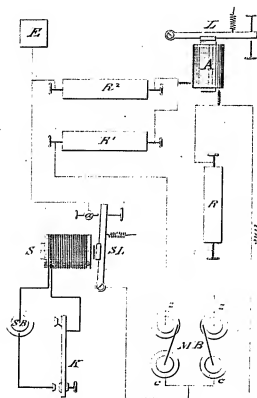
Rej'd

June 7" "

inspired at 1873's request

aw.

m m d



Witnesses:

Chas. Nida
Religioso

Inventor:

D. H. P. Blain
Per *Munroe*
Attorneys.

Witness May 25 1874.



To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the
Records of this office of the File Wrapper
Contents and Drawing in The matter of the
Abandoned Application of
Thomas A. Edison
Filed April 22 1873.
for
Improvement in Duplex Telegraph Apparatus.

In testimony whereof I have hereunto set my hand and
caused the seal of the Patent Office to be affixed at
the City of Washington this 11th day
of April, in the year of our Lord
one thousand nine hundred and seven
and of the Independence of the United States of
America the one hundred and thirty-first.

Edison
Assistant Commissioner of Patents.

P. G.

Case "F"

11576

P E T I T I O N .

To the Commissioner of Patents of the United States of America:

The Petition of Thomas A. Edison of Newark in the County
of Essex and State of New Jersey RESPECTFULLY REPRESENTS--
That your petitioner has invented a new and Improved

Duplex Telegraph Apparatus

which he verily believes has not been known or used prior
to the invention thereof by your petitioner. He therefore
prays that LETTERS PATENT OF THE UNITED STATES OF AMERICA
may be granted to him therefor, vesting in him and his
legal representatives the exclusive right to the same, upon
the terms and conditions expressed in the Act of Congress in
that case made and provided; he having paid Fifteen Dollars
into the Treasury of the United States, and otherwise complied
with the requirements of said Act. And he hereby authorizes
O. D. MUNN and A. E. BEACH, of the firm of MUNN & CO., of the
Cities of New York and Washington, or their accredited Agents,
to act as his Attorneys in presenting the application, and in
making all such alterations and amendments as may be required,
and to sign his name to the drawings.

Thomas A Edison

O A T H.

City & County of New York }
State of New York } ss.

On this Sixteenth day of April 1873, before the subscriber, A Notary Public in and for the said County, personally appeared the above-named Thomas A. Edison and made solemn OATH that he verily believes himself to be the original and first inventor of the within described Improved

Duplex Telegraph Apparatus

and that he does not know or believe that the same was ever before known or used; and that he is a citizen of the United States.

T. B. Mosher

Notary Public

(Notarial Seal)

--Case F--

Specification describing
a new and Improved

Duplex Telegraph Apparatus
invented by Thomas A. Edison, of
Newark, in the County of Essex
and State of New Jersey.

This invention re-
lates to apparatus for the simulta-
neous transmission of two dispatches
or signals from opposite ends
over the same line wire and
consists in the working of
the receiving instrument by induction
currents, generated in a secondary
helix by the incoming current,
when the outgoing current is
neutralized by helices wound
in opposite directions on the
same magnet, so that the
receiving instrument responds to
the signals of the distant sta-
tion without responding to the
signals of the home station.-
By means of an electro mag-
net placed between the battery
and the induction coils the ef-

-fect of the discharge of a static current is neutralized by the charge and discharge upon its iron core.

In the accompanying drawing--

Figure 1, represents a plan view of my improved apparatus for duplex transmission worked by induction currents and

Figure 2, a detail side elevation of the secondary helix, placed at right angles to the primary coils.

Similar letters of reference indicate corresponding parts

A, in the drawing, represents the receiving instrument, being a polarized relay or other electro-magnet of the usual form. It is connected by wires m with the secondary helix H, supported by a standard a and placed in a plane, vertical to the axis of the magnet B. Two coils I, and I' are wound upon the magnet B in opposite directions, helix I connecting with

the line and the battery M B,
helix I' with the battery M, B,
and a rheostat R to the earth
E.- These helices may also

be wound in opposite directions
in one coil instead of being
separated. The secondary helix
H embraces vertically the helix
I, the core B of which is
supported by standards a'..-

C is an electro-magnet placed
between battery M, B, and the
magnet B and connected by
wire n to contact stop b. of
the sounder lever S, L, which
is again connected to the zinc
poles of the two opposing
batteries M, B and M, B' and the
latter with the earth plate E'.

The sounder lever S, L, is ope-
-rated in the usual manner by
sounder battery L, E, Key R and
sounder magnet S.

The working of this appa-
-ratus for double transmission is
based on the principle of
galvanic induction, according to
which by each closing and open-

-ing of the battery momenta-
-ry induction currents of opposite
directions are produced. When
therefore, a current from the
distant station passes over the
main line into helix I of
core B, a momentary current
in opposite direction to the
same is induced in helix H,
which throws the lever or
tongue L of the polarized
relay A over to one side.-

When the battery at the
distant station is disconnected,
the induction current in the
secondary helix, though of e-
-qual direction with it, is in
opposite direction to the first
induction current and throws
therefore tongue L back to
its former place. The relay
A responds in this manner
to the signals from the dis-
-tant station by the opposite
induction currents of helix H.

On transmitting signals
from the home station to the
distant station, the current di-

-vides, before entering into coils I and I' .- They being wound in opposite directions on magnet B, exercise no influence upon it and induce consequently no currents in the secondary helix H. One part of the main current passes therefore to the distant station, the other part through rheostat R to the earth. The outgoing current exercises no effect on relay A, the relay at the distant station responding to the same.-

When both stations are transmitting at the same time, the current from the distant station produces induction currents in the secondary helix H so that the relay A responds to the signals of the distant station. The outgoing current being neutralized in the manner described, operating the relay at the distant station.- The conditions of double transmission are therefore fulfilled and the res-

-pective relays responding simultaneously to the currents from the other stations.-

The object of the electro magnet C is to neutralize the static current and to prevent a spark at contact b. The magnet C could also be placed on the compensating circuit, but would not be so effective.-

The disturbing effects of a discharge of a steady current on the magnet B and its helices I, and I' are neutralized by the charge and discharge of the current upon its iron core.-

Having thus described my invention,
what I claim as new and desire
to secure by Letters Patent is

First.- In apparatus
for double transmission, a polarized
relay A, placed in a secondary cir-
cuit to be worked by induction cur-
rents, generated by primary and
secondary helices I, and H, as described.

Second.- The secondary
helix H in connection with magnet
B, having opposite helices I and I'
to neutralize effect of outgoing cur-
rent, substantially as described.-

Third.- The electro magnet
C, arranged as set forth, to
destroy the static discharge, as
described.-

Thomas A Edison

Witnesses

Paul Goepel

Frank Blockley

3

U. S. Patent Office,
Washington, D. C., May 2^d, 1873

T. A. Edison

Care Munn & Co

Present

Please find below a Communication from the Examiner
relative to your app'n for patent for Duplex Telegraph.
case F filed April 22^d 1873

72/ 66

Very respectfully,

Commissioner.

-----O-----

Examiner's Room, No. 98

This app'n has been examined and a patent is refused for
the following reasons:

S L. S. R & S M. are described as being the
sounder & accessories when such is not the case. It is not
clear from the description & drawings how C neutralizes the
static current, nor how the "disturbing effects" spoken
of in paragraph preceeding claims are neutralized by "the
charge and discharge of the current upon its iron core".

As to the claims, the 1st is held to be lacking
in invention, it being old to apply a secondary current to
telegraphy, See ^G Doyle's patent Jan'y 31st 1860 and re^d app'n
of applicant filed Jan'y 15th 1873.

The 3^d claim is anticipated by patent of
J. B. Stearns 136,873, April 8th 1873.-

Z. F. Wilber

Exr

Washington D. C.

May 22^d 1873.

Hon M. D. Leggett
Comm^r of Patents

Sir:

I hereby amend the specification in
my application for Letters Patent for
Duplex Telegraph Apparatus, (case F)
filed April 22^d 1873, by erasing all of
specification except signatures and
substituting;

"To all whom it may concern:

Be it known
that I, Thomas A. Edison, of Newark,
in the County of Essex, and State of
New Jersey, have invented a new and
Improved Duplex Telegraph Apparatus;
and I do hereby declare that the fol-
lowing is a full, clear, and exact
description of the same, reference
being had to the accompanying
drawing, forming a part of this
specification.

*Case not
minut. for
Amend A.
Oct. 11 '73.*

~~This invention relates to apparatus~~

for the simultaneous transmission
of two dispatches or signals from
opposite ends over the same line
wire, and consists in the working
of the receiving instrument by in-
duction currents generated in a secondary
helix by the incoming current, while

*Elim and
insert for*

And A

Oct. 11 '73

the outgoing current is neutralized
by helices wound in opposite direc-
tions on the same magnet, embraced
by the secondary helix so that the
receiving instrument responds to the
signals of the distant station without
responding to the signals of the home
station. By means of an electro magnet
placed between the battery and the
induction coils the injurious effect
upon the latter of the discharge of a
static current is neutralized.

In the drawing-

Figure 1 represents a plan view of
my improved apparatus for duplex
transmission worked by induction cur-
rents, and

Figure 2, a detail side elevation

of the secondary helix placed at right angles to the primary coils.

A is the drawing represents the receiving instrument, being a polarized relay or other electro magnet of the usual form. It is connected by

wires m with the secondary helix H,

which is supported by a standard primary coil of magnet core a, so that, it will embrace the magnet

B. Two coils I and I' are wound upon the magnet B in opposite directions,

helix I connecting with the line and with the battery M B, while the helix I' connects with the battery MB and

through a rheostat R with the earth at E. These helices may also be

wound in opposite directions in one coil instead of being separated.

The secondary helix H embraces the helix I, the core B of which is supported by standards a' as indicated in Fig. 2.

C is an electro magnet placed between the battery M B and the magnet B and connected by wire n to contact with b of the operating armature lever

*Excess and
insert per
Smith &
Oct 11/73*

SL, which is again connected to the
zinc poles of the two opposing batteries
M B and M-B'. The battery M B' connects
with the earth plate E'. The lever S

*L is operated in the usual manner
by battery SB, key K and magnet S.

The working of this apparatus for
double transmission is based on the
principle of galvanic induction ac-
cording to which by each closing
and opening of a battery momentary
induced currents in opposite direc-
tions are produced. When therefore
a current from the distant station
passes over the main line into
the helix I of core B a wave of
electricity is induced into the coil

*Excess and
insert per
Smith &
Oct 11/73*

H in one direction, which causes
the relay A to be affected and
the lever or tongue I of the relay A to
be thrown over to one side. When
the battery at the distant station
is disconnected, a current is set in
the secondary coil opposite to the
induced current generated by the
closing which current causes the
tongue I to resume its former place.

The relay A responds in this manner to the signals from the distant station by the opposite induction currents of helix H.

On transmitting signals from the home station to the distant station, the current divides before entering into coils 'I and I'. They being wound in opposite direction on magnet B exercise no influence upon it and induce consequently no currents in the secondary helix H. One part of the main current passes then to the distant station, the other through rheostat R to the earth. The outgoing current exercises consequently no effect on relay A, although the relay at the distant station responds to the same. When both stations are transmitting at the same time, the current from the distant station produces induced currents in the secondary helix H, in the manner described, so that the relay A responds to the signals of the distant station. The outgoing current being neutralized in the manner described, operates the

*Examine Ind
magnet for
Sensitivity
Oct. 11/93*

relay at the distant station.

The conditions of double transmission are therefore fulfilled, the respective relays responding simultaneously to the currents from their opposite stations.

Each end must form

Art. 2. C The object of the electro magnet is to neutralize the injurious effect of the static current upon the induction coil, that would otherwise take place owing to a discharge and charge into the iron core B of such static current that is now, to a great extent absorbed by the magnet C.

Having thus described my invention, what I desire to secure by Letters Patent is:

1st The combination of the polarized relay A and conductors $\equiv \equiv$ with the induction coil H that embraces the magnet B, the latter containing the opposite coils I and I' as and for the purpose specified.

^d
2" The secondary helix H in connection with magnet B having opposite helices I and I' to neutralize effect of outgoing current substantially as described.

~~3^d The electro magnet C, arranged between and in combination with the battery M B, magnet B, coils I and I' and induction coil H as and for the purpose set forth".~~

Thomas A. Edison

Munn & Co
Attorneys.

U. S. Patent Office,
Washington, D. C., June 10", 1873.

T. A. Edison
Care Munn & Co
Present

Please find below a Communication from the Examiner
relative to your app'n for patent for Duplex
Telegraph. filed April 21" 1873

Case F

72
/ .66

Very respectfully

Commissioner.

-----O-----

Examiner's Room, No. 98

In this app'n the statement of p 2 that "the
outgoing current is neutralized by helices" &c", is
erroneous. The current is not neutralized else
it could not perform its work at the distant
station. ~~The~~ ^{The} effect however on the secondary
coil H of either I or I' is neutralized, by the
one by the other, by reason of ~~X~~ ^{equal} portions of the
current being passed through I & I' but in
opposite directions. In the conclusion of same
paragraph injurious effects of static current. What
are the injurious effects alluded to? On p 3 A is said to
be a "polarized magnet or other electro magnet of the
usual form" which form-- the forms mentioned do not
act in same way & if one worked in this connexion
the other would not, which form does applicant use?

A battery M, B' is shown in the drawings mentioned in specification but its relation and use are nowhere set out and apparently it is only a useless addition.

There should be some explanation of what relation the various devices bear to each, so, that the current is sent to distant station. As shown in drawing (and there is nothing to contradict this in the description) when S L is closed the current of the main bat..., M. B' instead of going to distant station would be short circuited through C ~~to~~ b & S. L. from one pole to the other of M B.

With satisfactory amends to the specification, explaining these points, the 1st & 2^d claims (with some amendment as noted on margin in specification) would probably be allowed

The 3^d claim however is rejected on reference to patent of J. E. Stearns March 18th 1873 No 136,873

Z. F. Wilber

Ex r

Case F.

Washington D. C.

October 9th 1873.

Hon. M. D. Leggett
r
Comm., of Patents
Sir:

I hereby amend the specification
in my application for Letters Patent
for Duplex Telegraph Apparatus, filed
April 21st 1873. by canceling recital
of invention and inserting:

"The inven-
tion relates to apparatus for the
simultaneous transmission of two
in opposite directions, over the same wire,
dispatches or signals, and consists

Inventor A.
Oct. 11/73. in the working of the receiving in-
strument by induction currents
generated in a secondary helix by
the incoming current, while the
effect of the current on said
secondary helix is neutralized by
helices which are wound in op-
posite directions on the same
core that is embraced by ^{said} the
secondary helix, so that the re-
ceiving instrument will respond
to the signals of the distant station
without responding to the signals

Amolt A
Oct. 11 '73 of the home station"

lines 4 & 5
Also by canceling on , page 3, of sub-
stitute specification, "being a polarized
or other electro magnet
relay , of the usual form", and in-
serting: -or relay formed of electro

Amolt B. magnets and a pivotal sounder
Oct. 11 '73 lever I, arranged between them in
a well known manner.

lines 2 & 3, & 4
Also by canceling on , page 4, the
words , zinc , poles of the two op-
posing batteries M B and M B'. The
battery M B' connects with the earth
plate E' , and inserting;

-to the
Amolt C positive poles of the main battery
Oct. 11 '73 M B and supplemental battery S B,
which have their polarities opposite
as indicated by the usual signs , and=

Also by canceling remainder of body
of specification after and inclusive
middle of page 4
of the words-"When therefore", and
inserting:

Amolt D. -When a current from
Oct. 11 '73 the distant station passes over

the main line wire, it primarily affects the helix I, and, owing to the resistance, ^{coil} or rheostat R, the main portion of it goes to earth, at E', through C, S B and M B the batteries, in view of their polarities being opposite, acting as it were conductors. The effect of this primary current in helix I is to cause a secondary or induced current in the surrounding helix H, and the latter, being connected with the relay magnets, the lever L gives the required signal.

When the distant-station battery is disconnected, the lever L will resume its former position, since a current is then set up in the helix H opposite to the induced current generated by the closing of said battery.

To transmit signals to the distant station, the key K is operated to complete the local circuit through magnet S and thereby cause it to attract the sending lever S L, and also form

Smith L.
Oct. 11 '73

*Amth 2.
Oct. 11 '73*

connection at contact stop b. The effect of this is to throw the battery S B into a shunt circuit with magnet C and lever S L, leaving the main battery M B to send a current through lever S L, stop b, and magnet B to distant station- it being clear that the rheostat R, whose resistance is intended to be at least practically equivalent to that of the line, will receive but part, say one half, of the strength of the current, while the helices I I' being wound in opposite directions neutralize each other and produce no effect on the secondary helix H and hence none on the relay A.

Thus the closing of the local circuit will cause a signal to be sent to distant station with at least one half the strength of the main battery current which divides at x.

It will be seen that the function of the supplemental battery S B is to neutralize the effect of the

Amold
Oct. 11/73.

main battery when the lever SL is open so as not to allow the same to send a current along the line through C, X, and I I'. But when the power of the main battery is required the supplemental battery is necessarily shunted as above described.

Amold
Oct. 11/73.

The object of the electro magnet C is to neutralize the retardative effect of the static current of the line upon the induction coil, giving as it does in becoming demagnetized when the battery is disconnected and the line put to earth, a return current of approximately the same strength as the return current of the line,-

Also by canceling 3^d claim.

Thomas A. Edison

Munn & Co
Attorneys.

New York October 15th 1873

Sir:

I hereby appoint Lemuel W. Serrell, New York, my agent and Attorney, in relation to my application for a patent on Duplex Telegraphs, revoking all previous authority and authorize him, or his substitute, to do whatever may be necessary in the premises, as fully and entirely as I could do if personally present, and to receive the Patent when granted.

Respectfully Yours,

Hon. M. D. Leggett

Commissioner of Patents.

Thomas A Edison

OFFICE FOR PATENTS,
119 & 121 NASSAU STREET, NEW YORK,
Octo. 15th 1873

The correspondence on this case, and also the Patent, when granted, you will please address to my care. Oblige by returning the drawing

Respectfully Yours,

Hon. M. D. Leggett

LEMUEL W. SERRELL.

Commissioner of Patents.

New York, Jan. 21 st 1875

To Hon.

Commissioner of Patents,

Sir:

In the matter of my application for a patent on Duplex Telegraph, case F filed April 21, 1873, I hereby abandon so much as there is in common to the present and to my application N^o 94. for a patent on Duplex Telegraph filed Sep. 1, 1874, and request that the latter may be considered as taking the place of the former application to the extent named.

Respectfully yours

Thomas A. Edison

per L. W. Serrell

Atty.

72/66

U. S. PATENT OFFICE.

APPLICATION OF:

T. A. Edison,
Ap. 21, 1873.

Filed

-----O-----

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Case F.

1873.

72/66

No.

Thomas A. Edison.

Of Newark,

County of Essex,

State of New Jersey.

Duplex Telegraph Apparatus.

Rec'd April 21, 1873,

Petition " " "

Affidavit " " "

Specification " " "

Drawing " 22 "

Model " "

Cert. dep. " "

/ Cash \$15. April 21, 1873.

Add'l Fee Cert.

" " Cash

Examined

Issue

Patented , 18 ,

Recorded vol. page

Circular

ABANDONED

Moff-and-Ge

Pressy

Lemuel W. Serrell

New . New York City.

1873.

Rej^d

May 2d 1873.---

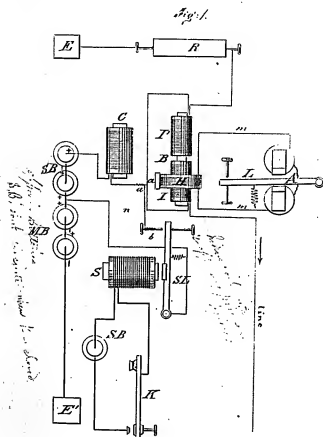
"

June 10" "

d.v.

on the 11

12/66



Witnesses:

Cas. Nida
Edgemo

Inventor:

P. H. Edison

Per

Munroe

Attorneys.

Reg. May 25 78.

2-389.

E 936

FOR IDENTIFICATION.

UNITED STATES OF AMERICA
Department of the Interior.
PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the
Records of this office of the File Wrapper
Contents and Drawing in the matter of the
Abandoned Application of
Thomas A. Edison
Filed April 22 1873
for
Improvement in Telegraphic Apparatus

In testimony whereof I have hereunto set my hand and
caused the seal of the Patent Office to be affixed at
the City of Washington this 11th day
of April, in the year of our Lord
one thousand nine hundred and seven
and of the Independence of the United States of
America the one hundred and thirty-first

Edison
Commissioner of Patents.

P G.

Case "G"

P E T I T I O N .

To the Commissioner of Patents of the United States of America:

The Petition of Thomas A. Edison of Newark in the County
of Essex and State of New Jersey

RESPECTFULLY REPRESENTS--

That your petitioner has invented a new and Improved Duplex
Telegraph Apparatus which he verily believes has not been known
or used prior to the invention thereof by your petitioner. He
therefore prays that LETTERS PATENT OF THE UNITED STATES OF
AMERICA may be granted to him therefor, vesting in him and his
legal representatives the exclusive right to the same, upon the
terms and conditions expressed in the Act of Congress in that
case made and provided; he having paid Fifteen Dollars into the
Treasury of the United States, and otherwise complied with the
requirements of said Act. And he hereby authorizes O.D.MUNN
and A.E.BEACH, of the firm of MUNN & CO., of the Cities of
New York and Washington, or their accredited Agents, to act
as his Attorneys in presenting the application, and in making
all such alterations and amendments as may be required, and
to sign his name to the drawings.

Thomas A Edison

O A T H .

City & County of New York)
) SS.
State of New York)

On this Sixteenth day of April 1893, before the
subscriber, A Notary Public in and for said County, personally
appeared the above-named Thomas A. Edison and made solemn
OATH that he verily believes himself to be the original and
first inventor of the within described Improved Duplex
Telegraph Apparatus, and that he does not know or believe
that the same was ever before known or used; and that he is
a citizen of the United States.

T. B. Mosher

Notary Public

(Notarial Seal.)

Case G

Specification describing

a new and Improved

Duplex Telegraph Apparatus

invented by Thomas A. Edison, of
Newark, in the County of Essex,
and State of New Jersey.

This invention

relates to apparatus for simultaneous transmission of dispatches or signals over the same line wire in opposite directions and consists in encircling the armature of the receiving instrument by a double coil and sending an equal current in opposite direction to the outgoing current through the same, so that the effect of this current is rendered nugatory on the receiving instrument. It consists further in placing an electro-magnet in the circuit of the main battery, for generating induction currents, and neutralizing the effect of the static current on the receiving instru-

ment. By spring connection of the sounder lever, the main battery is inserted on closing, and the continuity of the circuit preserved, on opening the same.

In the accompanying drawing.--

Figure 1, represents a plan view of my apparatus for double transmission, and--

Figure 2, a detail inside elevation of the receiving instrument with the double helix, encircling its armature.

Similar letters of reference indicate corresponding parts

A, in the drawing is the receiving relay, L its armature lever. B the double helix encircling horizontally the armature above and below the lever L and between the extended cores a, of the relay A. A vertical stand-

ard b, supports the helix B.

The current of the main battery is divided, passing equally but in opposite directions through relay, A and helix B. A regulating rheostat R connects the helix B to the earth at E.

A third circuit branches off by wire m, from the main current and passes through the coils of the magnets C and C' to the earth. M, B, is the main battery connecting with both poles to a wedge shaped double contact d, e, of sounder lever S, L. Contacts d, and e, are insulated from each other, but act, on closing the sounder lever to its magnet S, respectively on two spring contacts f, g, also of wedge shape, which are supported by standard h. When the sounder lever S, L is open, the edges of spring contacts f, g, touch each other, and being connected to the earth at R', preserve the continuity of

the circuit. The wedge contacts d, e, by separating contacts f, g, insert thereby main battery M, B, into the circuits.

Wire m' conducts the current of the main battery from spring contact f, to the relay A, helix B and magnets C, C', on the closing of sounder lever S, L. The latter is operated in the usual manner by sounder battery S, B, key R and magnet S.

When the distant station is sending, the armature of the receiving relay A, responds to the signals, the current passing over wire m', and spring contacts f, g, to the earth. When however the home station is transmitting the sounder lever S, L, separates by its wedge contacts d, e, the spring contacts f, g, throwing thereby the main battery M, B, into the circuit. The current passes equally through the relay A to

the line, and through helix B, in opposite direction to the earth, preventing the action of the armature, by balancing the magnetic current of relay A. The relay at the distant station responds therefore to the signals of the home station, the effect of the outgoing current on the relay of home station being neutralized. By placing the coil B in this manner around the armature the generation of induction currents may be prevented in the relay itself, when one helix is enclosed within the other.

When both stations are transmitting at the same time, relay A responds to the signals of the distant station, as the outgoing current is neutralized in the manner described. The relay of the distant station responds to the signals of the home station, transmitting the dispatches simultaneously over the line.

The magnets C, C', form a third circuit of the main battery M, B, and generate by their charged and discharge induction currents equal to the static currents of the line.

These induction currents act on the double helix B in opposite directions as the static currents on the relay A, and neutralize therefore their effect on the same. The regularity of the working of the relay and helix are thereby secured and confusion of signals effectively prevented.

Having thus described my invention.

What I claim as new and desire to secure by Letters Patent, is--

First. The armature

of the receiving instrument A encircled by double helix B, placed between the extended cores a, of the relay A, substantially as set forth.

Second.- The sounder lever S, L, having insulated wedge contacts a, a, in combination with spring contacts a, f, to insert main battery and preserve continuity of circuit, substantially as described.

Third. The induction coil or magnets placed within, a compensating circuit for neutralizing the effect of the static current, substantially as shown and described, and for the purpose set forth.

Thomas A Edison

Witnesses

Paul Goepel.

Alex F. Roberts

5.

U. S. Patent Office,

Washington, D. C., May 3d, 1873.

T. A. Edison

Care Munn & Co.

Present

Please find below a Communication from the Examiner
relative to your app'n for patent for Duplex Telegraph,
Case U, filed April 21st 1873

Very respectfully,

Commissioner.

Examiner's Room, No. 98

This app'n has been examined and a patent refused for
the following reasons.

Imprimis, the misnomers alluded to in the previous
cases occur in this.

Appt does not state how this device acts as a duplex
when both stations terminal stations are transmitting i.e.
the path and effect of the current from the distant station.

The 2d claim is substantially anticipated in patent of
March
J. B. Stearns April 18th 1873 (136,875) and the 3d in Stearns
patent 136,873 of same date. Appts attention is also called
to the fact that substantially this device is shown & claimed
by him in several of the other applications of this same series.

Z. T. Wilber

Exr

Washington D. C.

May 23^d 1873.

Hon H. D. Leggett

Comm^r of Patents

Sir:

I hereby amend the specification in
my application for Letters Patent for
Duplex Telegraph Apparatus, (case G)
filed April 21st 1873, by erasing all of
specification except signatures and
substituting:

"To all whom it may concern: .

Be it known
that I, Thomas A. Edison, of Newark,
in the County of Essex, and State
of New Jersey, have invented a new
and Improved Duplex Telegraph Ap-
paratus; and I do hereby declare that
the following is a full, clear, and
exact description of the same, reference
being had to the accompanying draw-
ing, forming a part of this specifica-
tion.

This invention relates to ap-

paratus for simultaneous transmission of dispatches or signals over the same line wire in opposite direction, and consists in placing the armature lever of the receiving instrument between two coils which are in connection with the main battery of the home station so that they will neutralize the effect of an outgoing current on such armature lever. It consists further in placing an electro magnet in the circuit of the main battery for generating by the charge and discharge of such magnet induction currents in the lever coils that will oppose in direction and therefore neutralize the static current and its effect upon the receiving magnet.

By spring and wedge contacts of the armature lever of the sending magnet the main battery is inserted, or closing and the continuity of the circuit preserved on opening the same.

In the drawing

Figure 1 represents a plan view of my apparatus for double transmission, and

Figure 2 a detail side elevation of the receiving instrument showing the armature lever between the double helix that encircles the armature.

A in the drawing is the receiving electro magnet, L its armature lever, B a double helix encircling the armature above and below the lever L and placed between the extended cores a of the electro magnet A. A vertical standard b supports the helix B. The current of the main battery M B is divided, so that part of it will pass equally the electro-magnet A and the other part through the helix B. A regulating rheostat R connects the helix to the earth at E. A third circuit branches off by wire m from the current of the main home battery and passes

through the coils of magnets C and poles of the C' to the earth E. The, main are battery M B is connected with both its poles to a wedge-shaped double contacts d and e of the armature lever S L of the sending magnet. The contacts d and e are insulated from each other but act on closing the lever S L to its magnet S, respectively on two spring contacts f and g that are also wedge shaped and supported by a standard h. When the lever S L is open, the spring contacts f g touch each other, and being connected to the earth at E' preserve the continuity of the incoming circuit. The wedge contacts d e will, when S L is attracted to S, separate contacts f g and insert the main battery M B into the circuit.

The wire m' then conducts the current of the main battery from spring contact f to the electro magnet A, helix B and magnets C C'.

The lever S L is operated in

the usual manner by a battery S B,
key K and magnet G.

When the distant station is
sending the armature L of the
receiving electro-magnet A res-
ponds to the signals, the cur-
rent passing then over the wire
m' and spring contact f g to the
earth E'.* When however, the home
station is transmitting the lever
S L separates by its wedge con-
tacts d e the spring contacts f
g, throwing thereby the main bat-
tery M B into the circuit. The cur-
rent passes then in part through
the electro-magnet A to the line,

Send per
Smith's in part through the helix B, to the
Oct. 11/73 earth, exercising in B an opposite

effect to what it does on A, which
will prevent the action of the armature,
by balancing the magnetic current in A.
The relay at the distant station res-
ponds however to the signals of the
home station, the effect of the outgoing
current on the armature lever of the
home station being only neutralized.
By placing the coil B in this manner

around the armature, the generation of induction currents may be prevented in the relay itself, when one helix of the same is enclosed within the other.

When both stations are transmitting at the same time, the lever L of each station responds to the signals of the distant station, as the two main batteries by being thrown into joint action, duplicate the power of the line current and increase in proportionate degree that of the opposing influence of the helices B.

Each helix is connected to the main battery by a third portion of the outgoing current of the main battery is passed to the earth and by their charge and discharge an induction current is generated equal in power but opposite in direction to the static current of the line. These induction currents act on the double helix B in opposite direction to the static currents, and neutralize therefore their effect on the magnet A. The regularity of the working of the magnet A and

helix B are thereby secured and confusion of signals is effectively prevented.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1st The armature of the receiving instrument A, encircled by double helix B, which is placed between the extended cores a of the electro-magnet A, substantially as set forth.

2d The lever S L having insulated wedge contacts d e, that connect respectively with the poles of the main battery, and combined with the self closing spring contacts a f, that connect respectively with *line and* the line and ground, substantially as and for the purpose *described.*
Amend D. pose described.
Oct. 11'73

3d The induction coils C C', arranged in combination with the encircling coil B, electro magnet

Cable and A and line wire, all of which
insert for parts receive part of the outgoing
Amth 2. current for the purpose described."
Oct 11/73.

Thomas A. Edison

per Munn & Co

Attorneys.

12th June

U. S. Patent Office,
Washington, D. C., June 10th, 1873.

T. A. Edison

Care Munn & Co
Present

Please find below a Communication from the Examiner
relative to your app'n for patent for Duplex Telegraph filed
April 21st 1873 Case G 72/67

Very respectfully,

Commissioner.

Examiner's Room, No. 98

As shown in the drawings upon the main battery M. B.
being thrown in by key S.D, a short circuit of such battery
would apparently be established say by d.f.m m', C,C',
E,E' G & e. If ~~such a relation exists~~ whereby all the cur-
rent would be shunted around A & B. If such a relation ^{exists} between
the different parts as to prevent this, it should be set forth
and explained otherwise the apparatus is inoperative as a
duplex instrument.

As to the claims the 2d & 3d as amended are substantially
the same as the original 2d & e & are again rejected on refer-
ences previously cited.

of Appt's device
The novelty consists in a peculiar form of differential
relay, covered by 1st claim. In other respects the system, shown
is the ordinary duplex. As

After-preper That claim will probably interfere with
other pending applications.

Z. T. Wilber
Ex

"Cass G."

Washington, D. C.

October 9th 1873.

Hon M. D. Leggett
Comm^r of Patents

Sir:

I hereby amend the specification
in my application for Letters Patent
for Duplex Telegraph Apparatus, filed
April 21st 1873, by canceling remainder
of recital of invention after and
inclusive of "placing an electro
magnet", and inserting:

the ar-
rangement of spring and wedge
contacts with such coils, the relay,
and a Rheostat, and with the
sending battery, and connecting wires
so
as to throw said battery into
Amend A. and out of circuit, and effect
Oct. 11/73. the transmission of a signal
on the line without giving a signal
at the home station.

Also by inserting following after
the words "in part through the
the words
Amend B helix B¹ and coils C C¹ line 15
Oct. 11/73. page 5.

Also by canceling on page 6 words
between and inclusive of "Through"
line 15, and "generated," line 21, and
inserting:

The rheostat R' prevents
too large a share of the current
passing to earth when the main ^{also}
battery is thrown into circuit, and

Amend C.
Oct. 11/3, the short-circuiting which would
otherwise take place through the
7m earth plates or contacts E R' main
battery M, B, spring and wedge con-
tacts and coils C C'.

The charge and discharge of the
coils C C' when a portion of the
outgoing current is passed through
them, generates an induction cur-
rent.

Also by canceling 2d and 3d claims
and inserting:

"2d The spring and wedge con-

Amend D. tacts f g and d e, pivoted sending
Oct. 11/3, lever S L, battery M B, helices B, sounder
lever L, magnet A, and con-

Amth. L. necting wires all arranged as
shown and described to operate
Oct. 11/73. as specified."

Thomas A. Edison

per Munn & Co

Attorneys.

New York Octo. 15th 1873

Sir:

I hereby appoint Lemuel W. Serrell, New York, my agent and Attorney, in relation to my application for a patent on Duplex Telegraphs, revoking all previous authority and authorize him, or his substitute, to do whatever may be necessary in the premises, as fully and entirely as I could do if personally present, and to receive the Patent when granted.

Respectfully Yours,

Thos A Edison

Hon. M. D. Leggett

Commissioner of Patents.

OFFICE FOR PATENTS,

119 & 121 NASSAU STREET, NEW YORK,

Octo. 15th 1873

The correspondence on this case, and also the Patent, when granted, you will please address to my care. Oblige, by returning the drawing

Respectfully Yours,

LEMUEL W. SERRELL.

Hon. M. D. Leggett

Commissioner of Patents.

Copied page 421

"Case A."

EXAMINER'S ROOM NO.98

U.S. Patent Office,

Washington, D.C., Octo 18", 1873.

L. W. Serrell Esq

119 & 121 Nassau St

N. Y. City

In the matter of your request for return of dwg's in Edison's Appns for Duplex Telrs I am instructed by the Comm'r to say that while resident attorneys are allowed to withdraw dwgs he cannot consent to their withdrawal when they are to be sent to distant points.

The difficulty danger of mutilation and of loss, and the trouble and expense incident to their carriage by mail or express back and forth, are the reasons therefor.

Very Resp &c

Z. T. Wilber

Exr

72.67

U: S. PATENT OFFICE.

APPLICATION OF

T. A. Edison.

Filed Apl. 21, 1873.

CONTENTS OF THIS FILE.

- 1 Application
- 2 Office Letter May 3/73
- 3 *Substitute Specification*
- 4 Office Letter June 10/73
- 5 *Amend's A. to S. Oct. 11/73*
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Case G. 1873.

NO.

72/67

Thomas A. Edison,
Of Newark,
County of Essex
State of New Jersey,
Duplex Telegraph Apparatus.

Rec'd April 21, 1873.

Petition " " "

Affidavit " " "

Specification " " "

Drawing " 22 "

Model " " "

Cert. dep.

Cash \$15. April 21, 1873.

Add'l Fee Cert.

" " Cash

Examined

Issue

Patented

Recorded vol.

Circular

ABANDONED.
18
page

Munn-and-Ge-

Present.

Lemuel W. Serrell

New York City

1873.

Rejd May 3 1873
" June 10" "

S.W.
M.P.

Patent Application Drawings

This set of drawings covers the years 1876-1878 and is organized according to case number. Most of the drawings are in the form of tracings, and the series is not complete. Those drawings for which there is no issued patent, or which contain additional information not found in the printed patent, have been selected for microfilming. They relate to the telegraph (cases 121, 142, 145, and 148), the aerophone (case 153), the phonograph (cases 154 and 155), and the telephone (case 159).

Case drawings not filmed: 125, 128, 130, 132-133, 135-136, 138-141, 143-144, 146-147, 150-152, 160, 168.

Missing case drawings: 1-120, 122-124, 126-127, 129, 131, 134, 137, 149, 156-158, 161-167.

J. A. Eichen

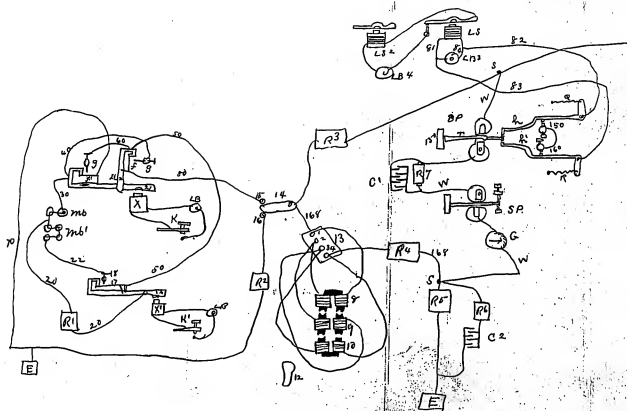


Fig. 1.

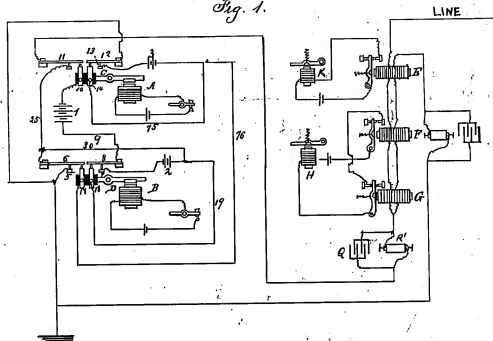


Fig. 2.

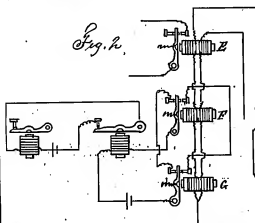


Fig. 3.

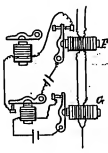


Fig. 4.

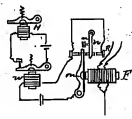


Fig. 5.

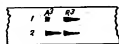
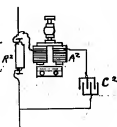


Fig. 6.



842
TIME
Thomas A. Edison
Inventor of Quadruplex Telegraphy.
No. 142

Filed Aug. 22. 1877. —

Copy of Claims. —

1st The combination in a quadruplex telegraph of the batteries 1, 2, 3, keys A, B, and their circuit connections with the relay magnets F, G, E, armature levers and local circuits arranged to operate the sounders H and K by the varying electric tension substantially as set forth.

2nd The combination with the artificial line in a duplex or multiplex telegraph of the rheostat R, condenser C, and adjustable magnet A, in the shunt around the rheostat, substantially as specified. —

Fig. 1.

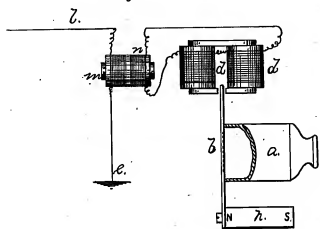
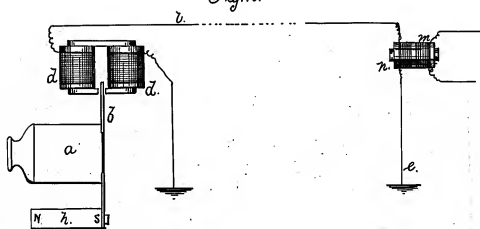


Fig. 2.



T. A. Edison

Fig. 1.

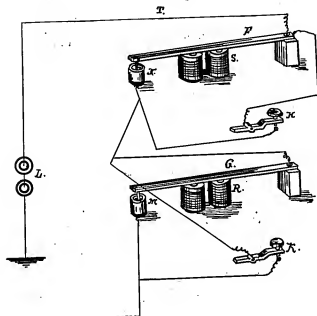
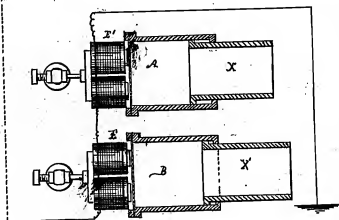


Fig. 2.

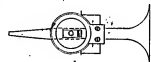


J. A. Edison

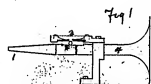
No. 153

No. 9.

Patent Office Model Edison Aerophone
Mime Part Xf. Feb 11 1878
Gharbachelev



C

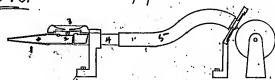


Printed Feb. 16 1878
J. K. Smith

No 153

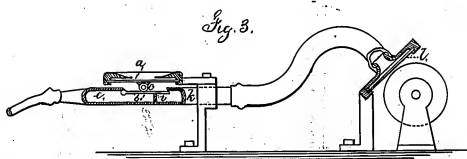
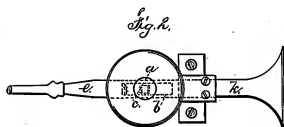
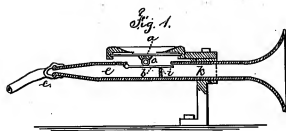
No 10.

Fig 2



Edison's
Aerophone
Patent Office Model
Feb. 11 1878 Mime Part Xf
Gharbachelev

Printed Feb. 16 1878
J. K. Smith



Casock 158.

J. A. Eason

Case 154

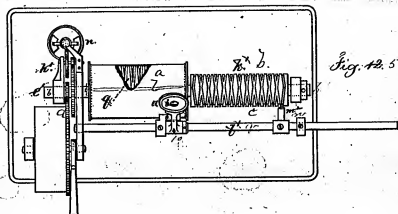


Fig. 12.5

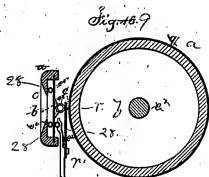


Fig. 10.9

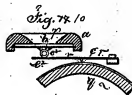


Fig. 10.10

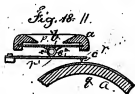


Fig. 10.11

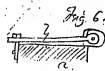
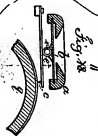


Fig. 6

Case No 154

These two devices have been put into another case since 184 was refused.

Case 154



These two devices have been put into another case since 184 was refused.

Fig. 13.

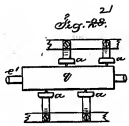
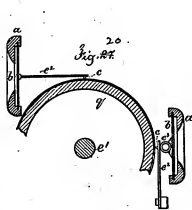
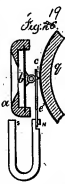
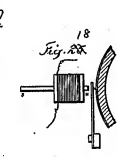
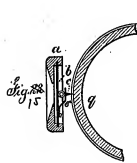
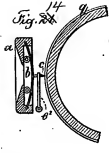
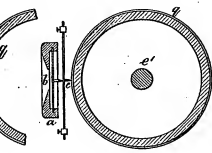
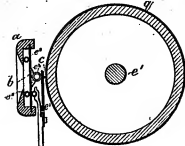
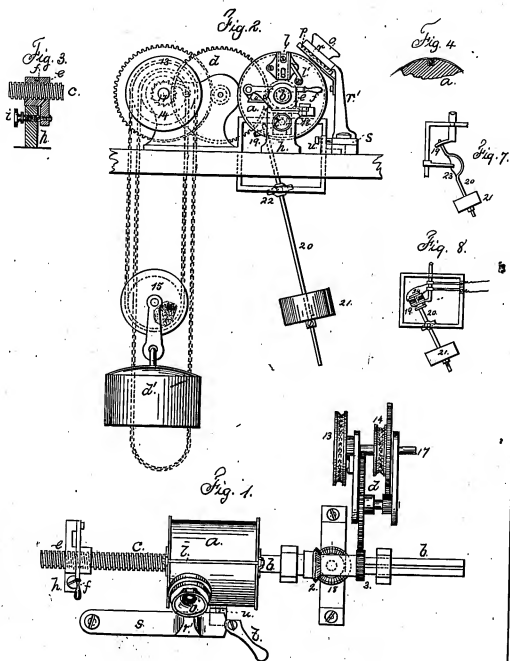


Fig. 25.



Case 154



Case 154

Fig. 5.

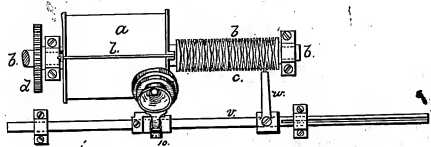
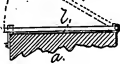
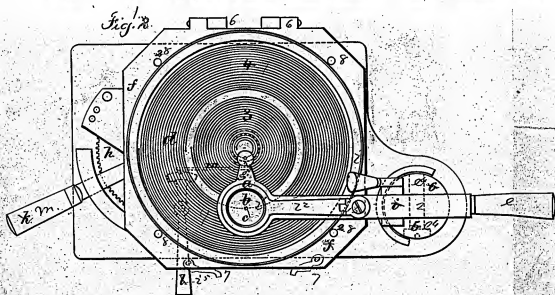
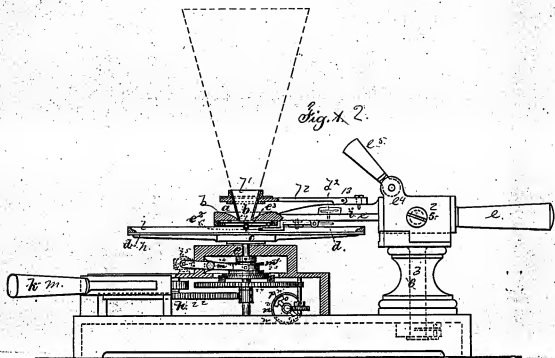
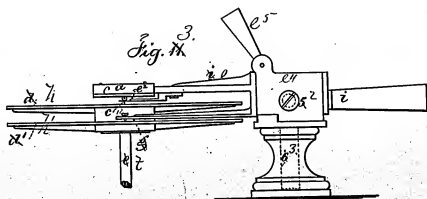


Fig. 6.

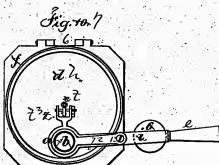
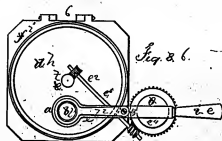
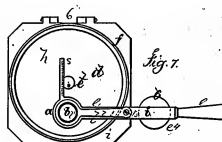
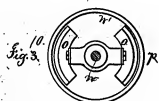
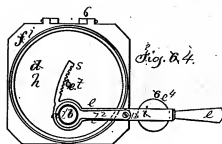
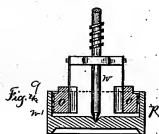


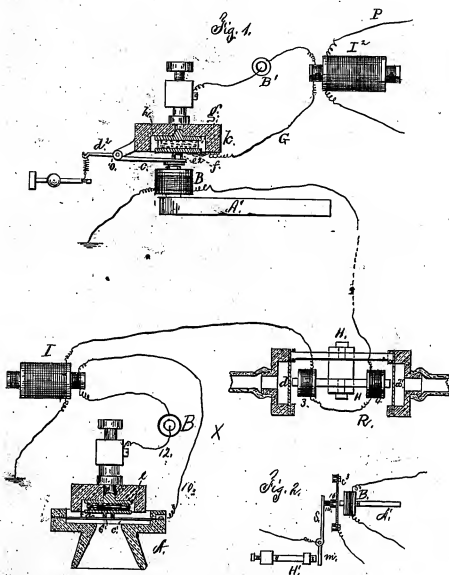


Drawings Case. 1857.



Drawings Case 155.





J. A. Edison

CAVEATS

Until 1910 the Patent Office permitted an inventor to file an official notice, or caveat, that he was working on a particular invention. If another individual subsequently filed a patent application for a similar invention, the first inventor was so notified. He was then given the opportunity to file his own patent application, which would be put in interference with the earlier application to establish priority. A caveat was valid for one year and could be renewed from year to year upon payment of a fee (\$10 in 1875).

There are few caveat materials at the Edison National Historic Site for the 1870s. In addition to the documents filmed in this series, there are also copies of caveats in the Document File and in other series on the microfilm.

List of Caveats Filed for Improvements in Telegraphy

This document provides a chronological listing of telegraph-related caveats filed by Edison between July 1, 1870 and March 23, 1875. The caveat numbers included on the list were assigned by the Patent Office at the time the caveats were received, and the numerical sequence began anew at the start of each year. This list of caveats appears in a volume of Patent Office proceedings and related material that was given to Edison by attorney Everett P. Wheeler. (See Volume 72, Quadruplex Case, Litigation Series.)

[Fig. 1]

List of Caveats filed for improvements in Telegraphy

LIST OF OATHS FILED BY THOMAS A. EDISON BETWEEN JULY 1, 1870, AND
MARCH 23, 1876.

[illegible]

E.—List of Caveats filed for improvem'ts in Telegraphy. 45

[illegible]

No. of Circuit.	Discoverer's Name.	Date of Filing.	Invention.
	Thomas A. Edison.	August 6, 1872.	Thermo-perforating telegraph machine.
✓ Same.	Do.	July 29, 1873.	Circuit for chemical telegraph.
Same.	Do.	August 10, 1873.	Perforated paper for telegraph use, and means for "transmitting" therefrom.
✓ Same.	Do.	Do.	Chemical telegraph.
✓ Same.	Do.	Do.	Thermo-perforating telegraph.
✓ Same.	Do.	Sept. 20, 1878.	Circuit for automatic telegraph.
	Thomas A. Edison and Jesse H. Dunsen.	Dec. 5, 1878.	Electric railway signal.

FROM QUADRUPLIX CASE. VOLUME 72

Caveats, Tissue Copy Book, Cat. 30,103

This copy book contains three caveats relating to multiple telegraphy. They are signed by Edison and are in his hand. The first is dated January 16, 1874; the second is for January 20, 1876; and the third is undated. The ink on many of the pages is very faint. Pages 112-118 contain faint copies of cash accounts for March 1875 and January 1876.

This book was also used for tests of Edison's duplicating ink. These begin on page 133 and continue, in lessening degrees of legibility, until page 155, with additional tests on pages 400, 407, and 487-501. The remaining pages are either blank or stained with ink. Many pages have been torn out.

The book contains 501 numbered pages, preceded by a nine-page index with no entries.

Pages filmed: 1-90, 133, 139, 400, 407, 499.

Memphis January 11 1874

The object of this invention is to transmit
numerical messages over a single circuit
at the same time without interference
with each other, by means of turning back
or locking following the law of the per se.

The invention consists in various methods
of transmitting the waves of
Electricity over the wire,
and of design for open and closed
the local circuit of a telegraphic
morse code.

In figure 1 is shown a method of
transmitting short waves of current
by means of balanced battery
L and K and L having its terminal
connected to line L while K has its negative
pole connected to the end.

Under the line vibrating reeds
(the reeds are) each of which
is connected to the line
and the other

Ground for the contact point to
which wires to automatically open
and close the local circuit containing
the battery LB' and a magnet M.
The points A and B of the same
reeds serve to open and close
for a very short period of time
the balancing battery K. The
thereby allowing the battery L to
transmit a wave of current over
the line of a length equal to the

Memorandum January 15, 1874

2

The object of this invention is to transmit
several messages over a single circuit
at the same time without interfering
with each other, by means of tuning forks
or bodies following the laws of the pendulum.

The invention consists in various methods
of transmitting the waves of
Electricity over the wire,
and of changing for open and closed
the local circuit of a telegraph,
more or less.

In figure 1 is shown a method of
transmitting short waves of current
by means of balance and balance
L and K having its own battery
connected to the line while K has its magnet
to the line to the line,
+ and - the two wires being needed
(the magnet is used) and of a local
circuit magnet to the line
for the line to the line.

And for the telegraph to
be able to transmit a message
along the local circuit of the line,
the battery L B' and magnet M
The present method of the same
will open to open and close
for a very short period of time.
The balance of battery K. then
thus allowing the battery L to
transmit a wave of current over
the line of a length equal to the

the length of time that the points
 of the balance are held by from each
 other by the movement of the reed
 & included in the same circuit
 as the points d & e of the other
 reed which also open and close
 the battery K allowing an other
 series of waves to be transmitted
 over the wire. if both d & e and
 d' and e' open at the same time
 to c , at the same as if one opened
 but as this does not occur any
 of the two distinct series of waves
 each of which is of equal strength
 are transmitted over the wire
 and reeds fork or rather pendulous
 bodies at the distant station
 are set in motion by the waves
 which occur periodic with its
 time of vibration.

The method of balancing the
 battery is such that no current
 shall pass over the line. I believe
 to be so to myself.
 By losing the flow of the current
 from L and K it will be noticed
 that the whole power circulates
 within the circuit in which they
 are placed and as the
 line and earth form a
 bridge wire across the circuit

~~through~~ any ordinary
 of a current to pass over the line
 from one battery in one direction
 is met by a current from the other
 battery in a contrary direction
 hence no current passes when
 the batteries are equal but if
 one of them be interrupted for
 an instant the balance is
 destroyed and the other
 battery transmits a current as
 long as it is shorter
 so is interrupted of the full strength
 of its battery.
 In practice I shall insert a
 wire of 1 or 200 ohms at
 4:5 to prevent the
 diminish the spark upon
 d e & d' e'.

In figure 2 is shown an other method
 for transmitting of a current of
 current against the wire
 and r are used c f and c f'
 are the ~~ends~~ of the wire. Contact points
 which serve to keep the current
 constant.

d and d' are the short circuiting
 the Rigid Contact points
 which with the leads themselves
 serve to short circuit for an

3, 4

was ~~shown~~ ^{shown} the balancing battery
L, and it is allowed the battery
K to transmit a wave of current
over the wire. K is a ~~balance~~ ^{balance}
of several hundred ohms which
serves to lower the impedance upon
the point of the object
of the signal point and to cause
a long wave to be transmitted
and thus prevent interference
with the receiver's needs by
the ~~so~~ ^{so} transmission of long &
short waves which take place
when each feed ~~and~~ allows
a long wave to be transmitted.
It will be seen that each
short circuit the battery independent
of the other feed.

The same method is shown in fig 3 except
that the rigid point is replaced with
spring points C & D.

An ~~enlarged~~ ^{enlarged} drawing of the
reed and contact points are shown
in figure 4.

In figure 5 is shown a method of
transmitting the waves by shortening
the main battery.

It is ~~shown~~ ^{shown} the ready provided
self make and break

5-

contact spring, e and f and e' and f' are short-circuiting contact spring connected together with the battery by the wires 2 3 and 4. So that e and f and e' and f' are in contact the short-circuit is complete but is broken when either the points are separated from one another by the movement of the record thus allowing "battery to transmit a short wave in the wire. A variable may be inserted \times to lessen the work upon the contact points

In figure b. we show a transmitting circuit as some advantages over the one with a one magnet. It is the other side of the same coin. The electromagnets M and N

g and h are two contact points opposite two spring points on record r and are so connected that when the record goes to the right the current from the local battery AB is thrown through the magnet on the left which attracts the record which coming in contact with the point h on the left throws the current through the magnet N. It is the other side of the record

to that magnet and so on. Thus giving
 away eddy vibration to the reeds.
 d and e are the line contact
 points by which the current can be
 made to flow upon the line in
 any of the methods already described.
 The K p. Key which serves to
 connect the contact points and
 run battery M B or it may short
 circuit the contact points only.
 It is obvious that several of these
 reeds having different vibrating
 times may be combined together
 for transmitting several series
 of waves over the wire.

In figure 7 is shown another method
 of transmitting the vibration or waves
 of current over the wire. The peculiarity
 of the device consists in providing
 the contact points in such a manner
 that the length of the waves
 is independent of the amplitude
 of vibration of the reed.
 Thus providing one reed from
 which with another at
 a station by the
 waves of different

length. The read r in this case makes ~~less~~ the number of vibrations and as there are waves $\frac{1}{2}$ in d is a contact spring or lever as the case may be provided with a V shaped tooth near its extremity and immediately under it a similar shaped tooth upon the read r . When the read r goes to the right the spring d is forced downward in contact with the point K closing the line $Circ$, R or the circuit of a balanced d etc. etc. and when it goes to the left the spring d is again forced downward in contact with R . h & k are limiting screws. It will thus be seen that the time which d remains in contact with R is independent of the amplitude or swing of the read r to a great extent.

L, M, P, Q are the self acting contact breakers of the local battery LP & magnet M .

I don't wish to confine myself to any particular read or method of keeping it in position as this may be combined with the

one of the forms shown in Fig. 1
 Fig. 8 is a cross-section of a
 line of the line contact, showing a
 series of metal contact points.

Block of insulating dielectric
 which in the case shown is to protect
 contact the balling of both when the
 real power to the right and left.

The figure of a cross-section of a
 dielectric block, the object being
 to insure the dielectric is not
 off-spring on itself. The dielectric
 the main contact and the
 contact opening. The dielectric
 or many need working in the

contact of C or C' in the case
 another contact is the need of
 a dielectric of some material
 the dielectric of A is placed in the
 form of contact points C and C'

Figure 9 shows a perspective
 view of the contact points for
 operation of the contact points
 double contact points.

is the method of
 by 6 in the case shown.

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is the magnet that operates the reed
 & is the reed M is a spool of wire
 through the center of which the reed
 & passes the spool has a constant
 current from the battery L.B. passing
 through it and causes a constant
 magnetization of the reed.

N is the magnet through which
 reversed currents are transmitted
 by the contact points c d & e f.

g and h are two batteries with
 opposite poles connected to the springs
 f and c. The other ends being
 connected to a polarized relay
 R and magnet N. Hence to reed

when the reed comes in contact
 with spring c. the battery g is
 in circuit and this current
 tends to throw the reed towards
 d. when it comes in contact

with f the battery h is towards
 and so on reversed currents
 passing through R & N.

the line contact is made by
 the line & contact point of
 the polarized relay.

In figure 11 is shown a method of transmitting reverses current to over the main line circuit by enlarged reeds. Though any reed operated by any of the means described in this or former contacts may be used.

It is to be used operated in the same manner as that described in fig 10. except the position of the contacts are changed.

C and ϕ are the main line contact points on both reeds.

X & Y are the two main line contacts with their opposite poles connected to the line. When the reed comes in contact with C one current is sent over the line and in the other course in contact with ϕ the opposite current is sent over the line. The other reed for as many more as are required act in the same manner. RR' & RR''

are key by which the reeds may be prevented from making

Contact with the battery. That is to
say prevented from becoming the
water over the wire. At the receiving
station A and B the two p-largized
reeds operated by the currents
which come over the wire.

~~There is~~
I shall now describe some of the
receiving reeds, their methods of
operation and also of ensuring
the repetition of signals into a
local circuit containing a Morse
sounder.

Figure 12 is shown a specimen of reed.
It is the reed set in motion by the waves passing
over the line and through the electro-magnet N
in the end of the reed R and underneath it is
a V shaped extension one end of which lies
between a V upon the local contact point
N. P is another contact point, when the
series of waves which set the reed in
motion are not coming over the wire the
V upon the reed is equidistant between the
two teeth of the V upon the ~~of~~ reed N
allowing the spring O to draw it
in contact with P and thereby of the
the local circuit, but when it is
come over the wire comes, it rises
periodic time as the same as the

[illegible]

In figure 13 is shown a modification. X is an extension of the reel proper made of any thin steel or aluminum. Or is the reel material lower the rate of travel and at the same time to magnify the amplitude so as to require more movement to operate the contact devices.

Inf. June 14. 6. Above a deepening
ridge and local sand dunes. See also
the top of the dunes.

It has been found in practice that owing to interference with the reed by the ^{other} possible effect of other series of waves not ~~in~~ ⁱⁿ phase with the reed that its movement is irregular and causes the sounder to work irregularly when it is ~~attempted~~ ^{attempted} the circuit is opened and closed by the reed. The main line reed with an aluminum extension of approx. the extreme end ~~of the~~ ^{of the} two contact springs both centered between the contact points a and b.

R is a longer but heavier. It reaches
lowering the beam a longer time as
the main beam recd. and is, placed
between two powerful electric
M. and H. L. B. is the local
Gating. When the recd. is obtained
by the beam, some of waves given the
was ~~strong~~ particularly speaking
immediately proper an electrical
of vibration sufficient to cause it
Contact spring, to touch first
a then 6. 45 on. It is a number
of times as it vibrates. These are
first vibrations. Carriage though
then M. of its local local
causing it to vibrate in the
same time ~~for~~ but its vibration

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a very much more powerful
 sound although the contact between
 g or the reed r and the paper
 a and b are irregular. It makes
 scarcely any difference with the reed
 R. The Reed R knocking
 against the reed points e & d
 give a powerful ~~sonorous~~ sound
 and if two ~~series~~ series of waves
 are transmitted over the wire
 following each other closely
 the will cause it to give out
 the sound of a dash and two
 waves following each other
 not so closely will sound as
 a dash in the manner previously
 described in one of my Carcets
 relating to this subject.
 But of desirable any of the
 pointed points shown in the
 a previous Carcets may be
 combined with R and cause
 a local circuit to be operated
 containing a Morse sounder

Figure 15 is shown three needs
all combined together and have
the same vibrating time for
the purpose of increasing the
amplitude of vibration.

Fig 16 is shown double reeds having the same vibrating time and operated by separate magnets. The local ~~contact~~ ^{oscillating} character at each vibrating, when ^{oscillation} is very slightly is sufficient to charge the secondary battery B & cause the ^{oscillation} to ^{correct} ~~charge~~ one of the object of this is to ~~prevent~~ ^{correct} the tendency of one reed being drawn towards the magnet upon the transmission of other sets of waves and show the local contact point to ^{be} ~~be~~ of adjustment.

Figure 9 is shown a wheel with two magnets attached to the same circuit and rotating together to give motion to the needle. Thus causing it to be ⁱⁿ sensitive to the short & feeble waves.

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transmitted over the wire.
In figure 16 is shown a series of
contact points arranged in the proper
manner to give the desired
local adjustment of the
solder & local balancing.

R is the result of the physical law. It is not the
 just does not come from the physical law.
 the spirit of the law is the result of the law.

drained, makes up the amount of water
with of allowing the blood to come
a great thickness of layers of material
by the use of the exposed surface of the
SB consisting of layers of material

viewed in a coordinating field
there infinitesimal central source
the halting to be a complete the and
when R is not in order, the thing
while vibratory of the mass, many
rattling, discharging the pulse the
sounding the bridging over the
road between the conductors.

Life figure 19 is the same as the one in the
new and which shows the

the local circuit up to the screen
C when the feed R is at a high
but when it is inhibited by the screen
of R against C. Keep it away
from C. partly from its mounting &
partly by the rapidly in it coils
the feed R. but if

In fig 20 is shown an extension
of the feed R by a thin aluminum
plate.

In fig 21 is shown the same circuit
as in fig 19 except that a repeating
sounder S is interposed to intercept
the dots and cause a more even
clearing of the ^{Repeating} sounder S.

In fig 22 is shown a method of making
up a large reed by reversing the
current derived from the ~~the~~
discharge of a powerful high
voltage magnet.

M and M' are 2 sets of
bridge. The other two are

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14th. The Reed & fig. 8. operated
 substantially as described & for
 the purpose set forth.

15th. The mechanism shown in fig.
 17 & 18 of transmitting short
 waves of circuit independent
 nearly so of the amplitude of
 vibration of the reed as reed
 for the purpose set forth.

16th. The self acting contact
 shown on ~~and~~ reed & magnets
 shown in fig. 19 & 20 after the
 purpose set forth.

17th. The relay shown
 in fig. 21. operated substantially
 as described & for the purpose
 set forth.

18th. The polarized reed mechanism
 in fig. 22. operated substantially
 as described & for the purpose
 set forth.

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14. The polarizing circuit of the
 of current by a ~~series~~ ^{series} of the
 tongue of a polarizing relay ~~is~~
 by a polarized or an unpolarized
 transmitting coil as shown on
 fig 10 for the ~~first~~ ^{first} ~~time~~ ^{time}

15. The transmission of
 positive and negative battery
 current by contacts operated
 by reeds having different
 vibrating times for ~~the~~ ^{the} ~~positive~~ ^{positive}
 and negative ~~currents~~ ^{currents}

16. The method of ~~transmitting~~
 transmitting ~~currents~~ ^{currents}
 received ~~by~~ ^{by} ~~the~~ ^{the} ~~receiving~~ ^{receiving}
 station ~~figure 11~~ ^{figure 11} ~~is~~ ^{is}
 the ~~per~~ ^{per} ~~the~~ ^{the} ~~receiving~~ ^{receiving}

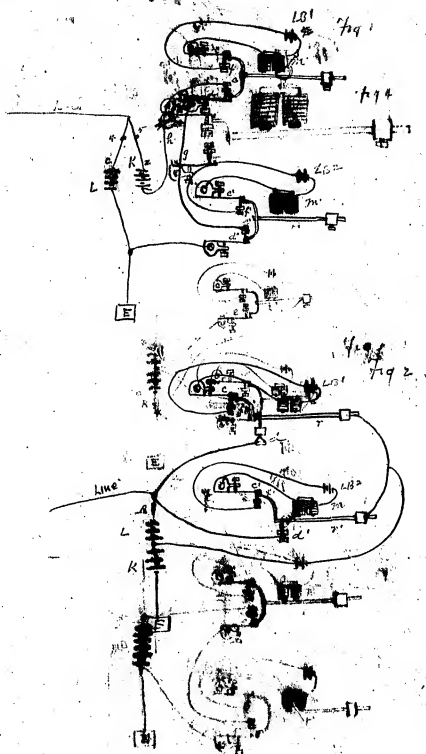
17. The ~~method~~ ^{method} ~~shown~~ ^{shown} in
 figures 12 13 15 16 18
 19 20 & 21 of operating the
 local current ~~at~~ ^{at} ~~the~~ ^{the} ~~receiving~~ ^{receiving}
 the receiving station

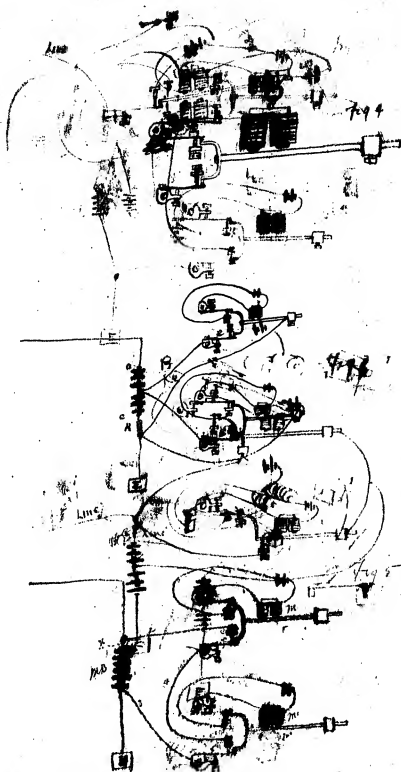
13th In an ~~acoustic~~ telegraph
the ~~transmission~~ local induction of
reed of ~~propagation~~ following the
law of the ~~transmission~~ ~~the~~
when ~~induction~~ the ~~induction~~ ~~the~~
by ~~induction~~ ~~the~~ ~~induction~~ ~~the~~
the main line ~~induction~~ ~~the~~
superficially ~~the~~ ~~the~~ ~~the~~
purpose of ~~the~~ ~~the~~ ~~the~~

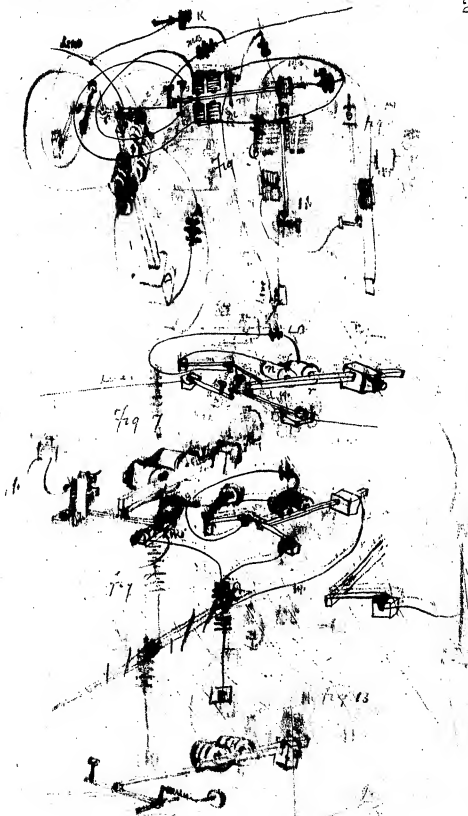
14th The magnetic shunt, in Fig. 17
increases the ~~delays~~ ~~the~~
magnetic power ~~the~~ ~~the~~ ~~the~~
by the employment of two magnets
with the main line ~~the~~ ~~the~~ ~~the~~

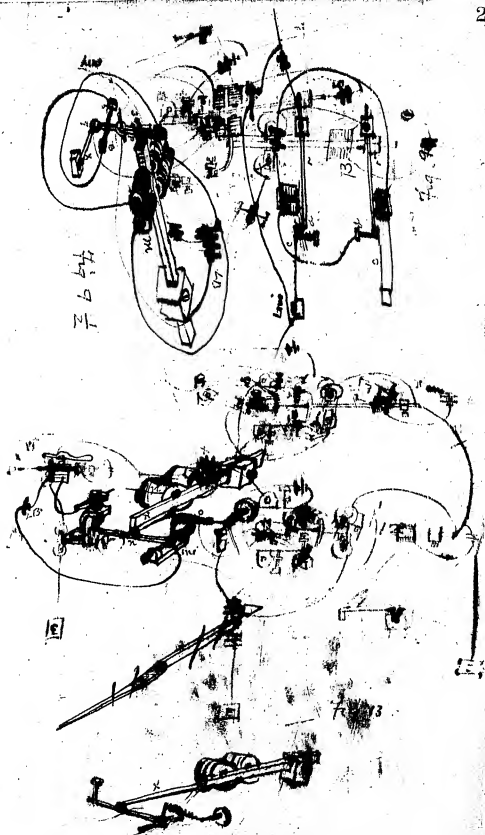
15th The employment of
three ~~the~~ ~~the~~ ~~the~~ ~~the~~
magnetic plates for a
wheatstone balance for a
palimpsest reed ~~the~~ ~~the~~ ~~the~~
as set forth ~~the~~ ~~the~~ ~~the~~

PA Edison









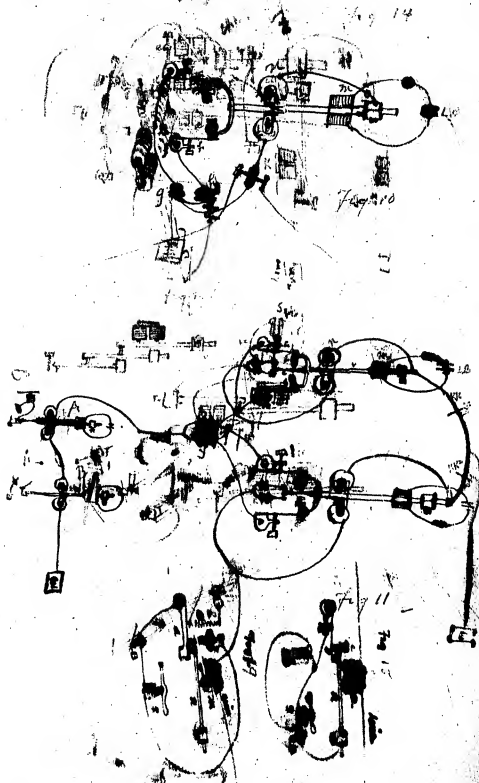


Fig 14

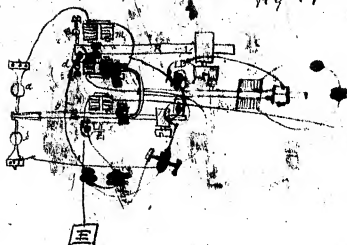


Fig 15

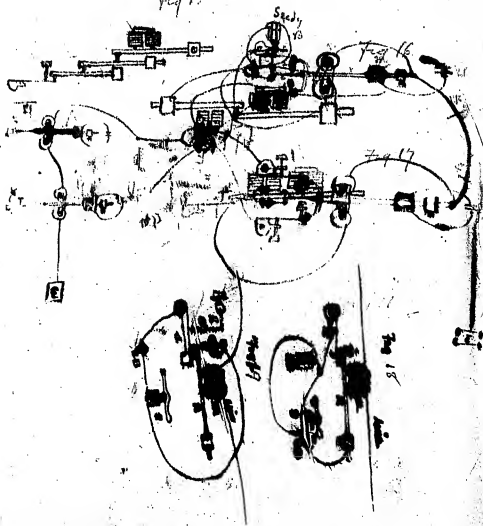
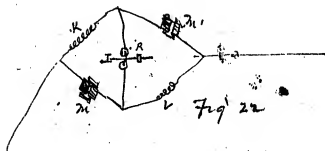


Fig 16

Fig 17

Fig 18



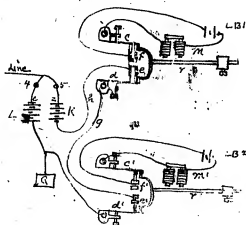


Fig. 1

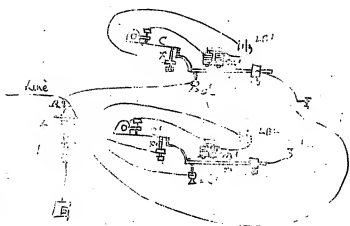
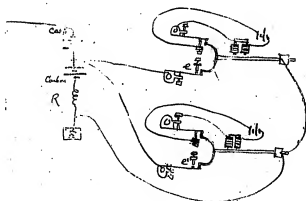


Fig. 2



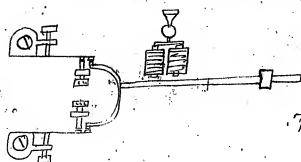


Fig. 4

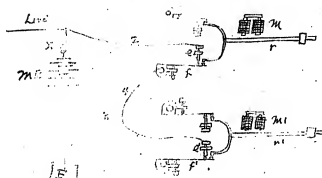


Fig. 5

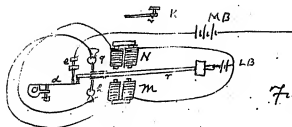


Fig. 6

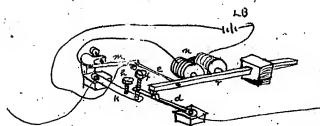


Fig. 7

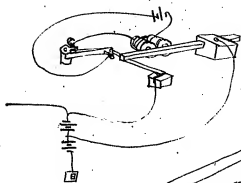


Fig. 8.

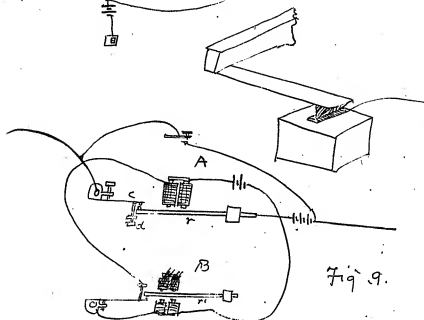


Fig. 9.

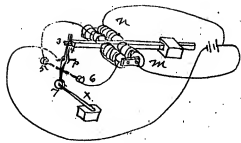
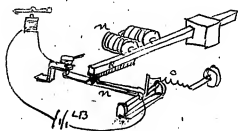
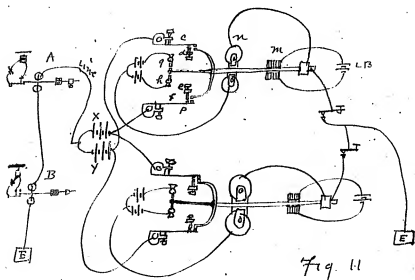
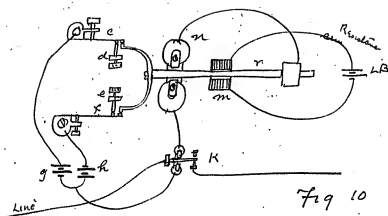


Fig. 9-1/2.



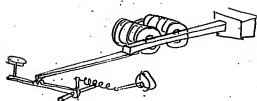


Fig 13

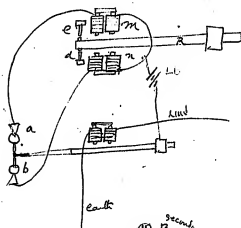


Fig 14

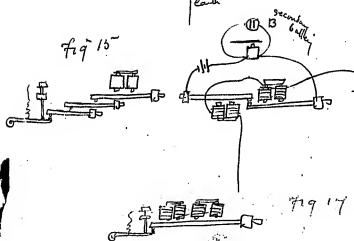


Fig 15

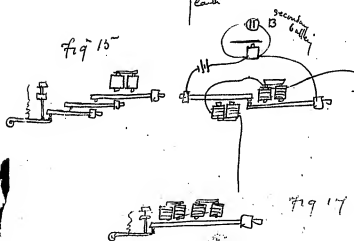


Fig 16



Fig 17

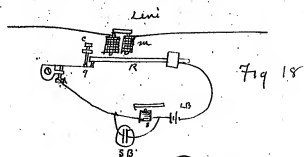


Fig 18

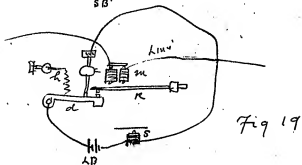


Fig 19

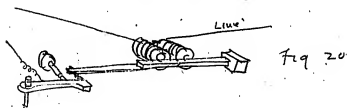


Fig 20

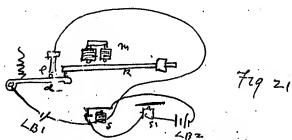


Fig 21

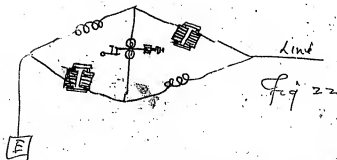


Fig 22

The object of this invention is to transmit several messages over a single wire in various directions at the same time.

The invention consists in an improved method of manipulating the electric currents.

In figure 1. is shown a method which was described in a previous patent relating to this subject. The only change consists in throwing the two balancing batteries MB^1 and MB^2 out of balance. In the battery MB^1 I put say 56 cells and in the battery MB^2 I put 80 cells. When either vibrator opens the circuit of MB^2 the whole 56 cells send their current upon the line; but when MB^2 is closed 56 cells are at balance and only the 24 cells of MB^1 and send a counter current of 24 cells into the line. This current serves to compensate for the static charge of the line & the self induction of the magnets at the receiving station.

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In figure 2 is shown a method by which the balancing battery is dispensed with, and the compensation for the static charge and the self induction of the receiving magnets is obtained by an electro-magnet M^1 which with a resistance coil R^1 forms a short circuit to the Earth, so that when ~~the~~ a wave of current is transmitted over the wire, a great portion passes down the short & charges the magnet M^1 and when the wave ceases the magnet discharges a counter current into the wire. R^1 & R^2 are keys which serve to short circuit the vibrator points and prevent the transmission of a particular series of waves. X^1 & X^2 are the receiving instruments provided with magnets wound differentially (C) with two sets of wires. When no waves are transmitted over the wire the main battery current goes to waste & through the magnets X^1 & X^2 and being

3

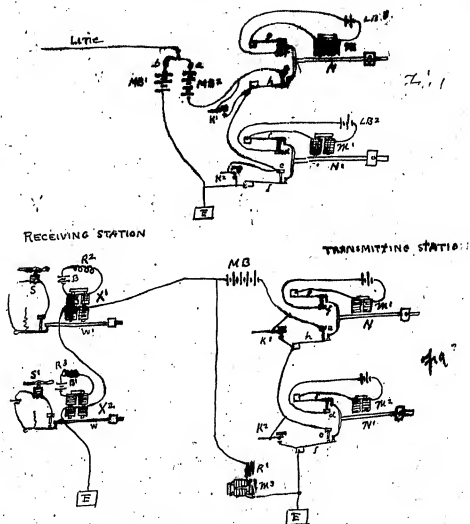
permanent current when no
 wires are being transmitted
 would throw the reeds out of
 adjustment. ~~can~~ but a cur-
 rent from a local battery B + B' - B
 locked passes through
 conductors in an opposite
 direction to the main current
 and being regulated by R. east.
 R2 & R3 just balance the
 main line current. It is obvious
 that instead of double wire
 the magnet might be shunted
 with a Resistance & battery
 sending a current through the
 coils in the opposite direction
 to the main current thus balancing
 it or a second magnet might
 be placed upon the opposite
 side of the reed ~~and~~ through
 which a permanent current
 circulates the balancing being
 obtained by adjusting
 the magnet to or from the reed

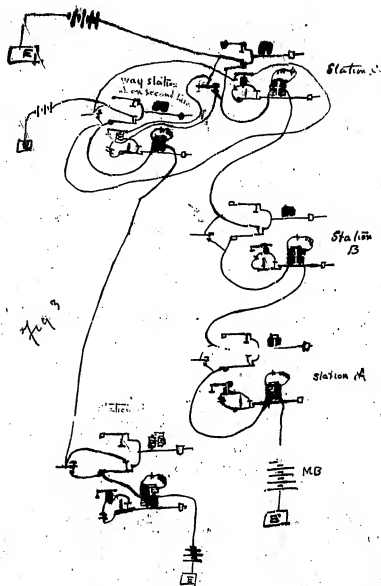
4

~~and by various other methods~~
~~such as~~ a ambulatory bridge.
 Could be used and various
 methods common to Duplex
 telegraph & or a polarized
 magnet could be used ~~and the~~
~~hollow~~ worked by induction currents.

In figure 3 is shown a Telegraph
 line with several offices upon
 it each of which is provided
 with say four transmitting &
 4 receiving circuits. (only one
 transmitter & Receiver is shown)
 and a side line with two
 or more stations.

By means of one set of
 transmitters & Receivers station
 A can communicate with
 station B of the side line or
 to station A. & they can converse &
 receive from A with the main
 line, at the same time station
 C B & A of the main line can
 communicate with each other.





by other sets of reed having
different periods vibrations.
Fig. 4. Shows another method
of compensating for the $\phi\phi$ &
residual charge etc.

MB¹ and MB² are opposing
main batteries. MB¹ has ~~the same~~ ^{no of cells}
~~MB² is~~. MB¹ is an electric
magnet which is included in
the short circuit formed by
the contact of a reed say f
with the point c. In this short circuit
MB² allows MB¹ to send a current
into the line, at the same time
MB² charges the magnet MB¹
powerfully, upon removing the
short circuit both batteries oppose
each other send no current
as MB¹ previously charged by the
short circuiting of MB² has now
into the line a powerful
counter current. There are
several methods of this

6

thus compensating by Condensers
and by induction coils with
Secondary helix,

I shall probably claim:

1st In an Acoustic telegraph
the transmission of strong waves
of current of one polarity
followed by weaker waves
of an opposite polarity for
the purpose specified.

2nd. Balancing, ^{the effect of} a permanent
current circulating in the mag-
netic circuit by an opposing
Electromotive force upon the
Receiving Electromagnet of
an Acoustic ~~the~~ telegraph.

3rd. The method shown in figure
2. 1874 for setting up ~~and~~
temporary circuits for the
purpose mentioned.

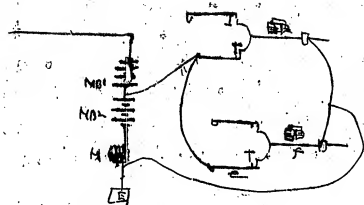


Fig 4

the ~~Representing~~ ~~from~~ ~~the~~ ~~me~~ ~~is~~ !
 shown in fig 3. for transmitting
 receiving several messages at
 the same time upon one main
 circuit between the two terminal
 the intermediate stations and
 upon between stations upon a
 line.

To
 J. C. ...
 J. C. ...
 H. ...

It is adapted to the operation of regulating
all kinds of telegraphic mechanism
and causing the synchronous movement
of two independent machines at
a distance from each other and con-
nected by a telegraphic circuit.

The invention consists of two acoustic rods,
having forks or other bodies following
the law of the pendulum operated elec-
trically in cooperation or indirectly by
the introduction of sonorous bodies or
columns of air between each rods
having forks or other bodies so that they
behave as the pendulum and the
electricity of such electrical parts
is connected by a telegraphic circuit
being provided with
contact points, switches,
connections and other prop-
erties which properly adapted
in perfect practical perfect
union with each other.
The invention further consists in
combining with such acoustic
instrument of other contact devices.

than is necessary to operate the roads
 chambers, which contact series
 devices through the wire, upon which
 the set is a series of magnets
 rods are placed, upon a series
 of electromagnetic contacts dis-
 connected from the road wire,
 at the other ends of the
 Danielson set that fall all a
 period of time when the wire is not
 becoming an occasional word
 the series of electromagnetic
 contacts in a branch
 with a set of magnets
 the contacts are placed in a
 to complete by means of the
 receiving the same number of
 as the road but not a set of the
 time and occurring just a great
 rapidly set up in a
 with the same number of
 constant. The
 The invention for
 In the various circuit points
 on a single set of the
 from the above the
 in the set of the
 and the set of the

synchronously at both ends of
the line, and the line is composed
of both positive and negative
currents. The same thing
the convention for the currents
in the method of transmission
is upon the acoustic
transmission as well as the
electricity by a reversal
of the current.

It is well known that if two bars
of steel of equal length
and thickness be placed
parallel that they will vibrate
and accurately represent
out the same note when struck
and make the same number of
vibrations in the same time.
It is also well known that the bars
can be automatically kept
vibrating by placing a
electromagnet upon one
side of the bars in such
a manner that when the
current is on the bar is kept

6

Electric current for a small battery
then, when the current
ceases the natural elasticity
of the bar will cause it to
spring away from the core of
the electromagnet. If a
circuit spring connected to a
battery, however, to the electromagnet
through its wire to the
battery, springing a distance the
bar will spring to force the
contact spring at equilibrium
when the bar is fully attracted,
the wire of the magnet this
distance of contact before the
the spring will be too far
for the bar to break circuit
the magnet will bar into
magnetism, and the spring
will be able to pull the core
but will again touch the
spring close the local circuit
and be again attracted by
the magnet, so on
alternating, when both
needs are allowed to break
the circuit one contact
the other so that it is

7 not absolutely necessary
 to all cases of same vibration
 in each that they should be
 be accurately lined, nor
 may even be a little higher
 or lower than the other.
 The result will be that the
~~of the vibration~~ will be
 the mean of the two,
 but the amplitude of
 vibration will not be the
 greatly as would be the case if the
 perfect condition, ~~is the same~~
~~the~~ These two are shown
 shown in figure one, and
 one of the ends of a vibration
 one of the following of the
 other end, when arranged
 in the manner of a simple
 accurately together. Both
 making the same number
 of vibration in each second
 and independent of the
 battery force, which only
 serves to increase or decrease
 the amplitude of or
 displacement of the bars, which
 do not affect the proper
 adjustment of the various

8

Contact points where
 and where in the subacoustic
 drawn p. Only a constant
 current circulating through
 the system. Current will be zero
 at a resonance the adjustment of
 and that is easily compensated
 for by simply adjusting the
 magnet to and from the need
 In figure X and X' are the two
 reeds, ~~B and B'~~ are the two vibrators
 kept in motion by the passage of
 electric current to M and M'
 The main lines contain of both
 MB' + MB at each terminal
 is connected to the vibrating
 bars of both instruments
 A and A' being the rigid pillars
 is connected to the source to receive
 the reeds, D and D' are the
 contact springs connected to
 the magnets + to the battery
 For the C and C' are limiting
 screws which serve to check
 the spring at that point where
 the reeds start vibrating
 When at rest, the reeds are

[illegible]

10

[illegible]

[illegible]

and none of these waves
can pass through the
electromagnets of the wheel
as a different & distant
series of waves went
to actuate the wheel magnets
at a time when the lead
is entirely disconnected
from the Morse apparatus
by a break in the circuit
between the spring & 9th
and the contact points
h and h'. The cones 10
& 10' form the Morse
or signalling beam which
carries the lever 3rd from
the second branch
containing it across the
cableway. No magnets
R and R' are in the signalling
key.

[illegible]

[illegible]

[illegible]

18

I will now mention that the
 ordinary relays R & R' may
 be replaced by polarized
 relays and controlled by
 single currents or by double
 currents in which case the
 brasses L & L' (or L & L')
 which I prefer to use) are
 made double and connected
 with the main battery as
 shown in figure 5.
 PR & PR' are the two polarized
 relays which are shown
 connected in the same working
 manner for working Morse
 in & M being directed to
 show the main current to
 either up or not in a similar
 way. L & L' are the reasons
 brasses which show
 to send positive & negative
 currents over the wire by
 action. The direction of
 the flow of current from
 the main battery.
 It is obvious that if the
 polarized relays PR & PR'

157

[Faint handwritten notes, mostly illegible due to fading.]

The use of the residual
 value is to obtain a copy

20

taking advantage of the fact that if the reeds are made of soft metal with an armature near their ends & wound to them & facing electromagnets, the reversing of the current will not in the least affect the

~~the~~ ^{the} vibrations or decrease their amplitude, as the Electromagnet will be polarized independently to both positive & negative currents, when the only way that an alternation is possible in the time the cores of the Electromagnets which serve to give motion to the reed may have its cores permanently magnetized. In this case a permanent ~~magnet~~ magnetized steel bar placed across its ends can be made to balance or neutralize it altogether.

21

as the waves which
 generate the a.c. mag-
 netic are always passing
 over the line, I include
 relay & relays. PR and PRA
 in the branch circuit taking
 the electromagnets of the
 circuit, the operation
 is as follows. If the Switch
 is closed so as to connect
 the branch line direct to
 earth the battery W will
 send a current into the line
 through the both Elchom
 magnets of the rods & both
 relay & relays, and
~~the magnets of the rods & both~~ the two pairs
 of both will be the same
 in one side. If now the
 key K be closed the
 current will be reversed
~~but the~~ and the tongues
 of the relay & relays thrown
 to the opposite side thus
 giving the signal. But
 the rods will continue
 to vibrate as the Elchom
 magnets not being provided
 with a directive force
~~are~~ are indifferent to
~~either of the two~~ the two

22

of the direction of the flow
of the current, at the same
time that messages are being
transmitted with the polarized
relays, messages can be
sent with the common relays,
in the manner previously
described.

In figure 9 is shown the
connection for Duplexing of
both of the transfer circuits
(10) ~~the~~ both branches, ~~with~~

~~Branches~~ It will only be
necessary to describe the connection
of one end to explain the other.

At the 10 is the branch
which only contains a cable
between the two ends of the line
of which is a common relay.

~~By means of the two~~
~~connections forming the~~
cell the connections in
the circuit are the same

as in the wire 10 fig 4
at X. or the connection may
be as in ~~fig 4~~ wire 10 fig
3 or in wire 10 fig 5.

Two Communications being
sent in opposite directions
at the same time.

But the connection of wire 15
 containing the reed magnet
 is similar to that of
 fig with the exception that
 the polarized relay PR and
 the Electromagnet of the reed
 are placed in the bridge
 wire of the Wheatstone balance
 formed by the resistance
 1 & 2. 3 is a resistance
 forming the additional wire
 for balance the tension to
 from the battery MB1
 so that they pass into the
 line but do not affect PR
 or the Reed magnet. The
 same operation takes place
 at the distant end
 by this means I am
 enabled to transmit
 two messages by means
 of the instruments in wire
 10 & 10' and two messages
 by two additional dis-
 polarized relays through
 the wire containing the reed
 magnets without at
 all interfering with the

Proper vibration of the
two rods, in all 3
directional services after galls

In Figure 8 is shown the two
rods and lead along upon a
segment sample wire, the bars
designed to have for an alter-
nate contact wire from one
set of groundbusbars to another
22 is the lead-off wire
directioning wire containing
the rods at back terminal
in circuit. ~~The groundbusbars~~
~~be more closely turned in~~
~~Figure 8~~ The contact of the
wires serve to mechanically
open and close the circuit
circuitry and keep the rods
vibrating in motion M.B.
Y.M.B. are the groundbus
Rods Backing

Upon the extreme ends of the
bars are contact springs
facing contact points
e f and g h. to which
the two sets of groundbusbars
are connected. The other
main line 20 is connected
to the bars themselves

at least at each operation
 the line 20 is alternated at
 the rate of 200 times per
 second from N & P to
 N & P, thus giving the
 operator ~~at~~ two distinct
 circuits to be in response
 to each of which may be
 employed or two displays in
 the manner already
 shown.

In fig. 9 is shown a
 method of connecting which
 need only break the
 circuit three contacts of the
 other, but it is of greater
 value than the other whole
 the impedance is used
 in the circuit. It is an
 advantage and not for
 the purpose of the circuit.

In fig. 10 is shown the
 connection for a way
 station X being the
 way station, in other words
 the wire is transferred
 to A, B, & C simultaneously
 and then to the other
 set of relays. The
 way is one of the branches

27

N and M.

C. & D. are included in the same main or Combating circuit and serve to transfer main line number 1 from the Signalling instrument 1 & 3 to ~~2 & 4~~ simultaneously and then to 2 & 4 directly. Local Signalling Crows C, E, F are two more breakers which serve to transfer the main line No. 2. on 5 & 7 and 6 & 8 in the same manner as with line No. 1.

It is not essential that the needs C, D, E, F should be placed in the main Combating Circuit, if they may be Roadways operated by magnets placed in local circuit to which receive breaks from an external control point & a primary placed in connection with the main need. The Connections for the local needs are shown in figure 13.

X and X' are the primary Combating needs, placed at the two ends

of the ~~to be~~ ^{of} ~~the~~ ^{the} ~~and~~ ^{and} the reeds
 vibrate continuously in the manner
 already described. In the point, a
 and b. of x and y may be attached
 the branch lines to the battery ~~in the~~
 in which branches there may
 inserted a ~~very~~ ^{very} ~~de~~ ^{de} ~~lay~~ ^{lay} ~~with~~ ^{with} ~~sounder~~
 attached and the same may
 be worked with reversed current
 or the branch or branches around
 them obtained may be displaced
 in the manner ~~of~~ ^{of} ~~the~~ ^{the} ~~reeds~~ ^{reeds}
 The reeds are provided with extension
 up or down ~~at the~~ ^{at the} ~~end~~ ^{end} ~~of~~ ^{of} ~~the~~ ^{the} ~~reeds~~ ^{reeds}
~~the~~ ^{the} ~~reeds~~ ^{reeds} ~~are~~ ^{are} ~~connected~~ ^{connected} ~~to~~ ^{to} ~~the~~ ^{the} ~~battery~~ ^{battery}
 other ~~points~~ ^{points} are ~~connected~~ ^{connected} ~~to~~ ^{to} ~~the~~ ^{the} ~~battery~~ ^{battery}
 platinum ~~tips~~ ^{tips} are ~~attached~~ ^{attached} ~~to~~ ^{to} ~~the~~ ^{the} ~~reeds~~ ^{reeds}
 the platinum tipped contact wires
 C and C' and at same time a pair
 of the reeds. The springs ~~are~~ ^{are} ~~separated~~ ^{separated} ~~from~~ ^{from} ~~the~~ ^{the} ~~points~~ ^{points}
 are separated from the points
 by ~~the~~ ^{the} ~~reeds~~ ^{reeds} ~~themselves~~ ^{themselves} ~~and~~ ^{and} ~~the~~ ^{the} ~~local~~ ^{local}
 circuit simultaneously at both ends
 of the line. In this local circuit
 at both terminals are several
 reeds (two at each end are only
 shown) and focal batteries LB¹ and
 LB². It follows that these
 reeds at both ends will vibrate
 simultaneously together.

and the bars of each being connected together by a line wire the wire will be insulated from one set of instruments to another independent set of instruments and many times per second as the reeds vibrate at always at the same moment. A and B are one set of local reeds to which the main line No 1 is connected and C and D are the contact points for one branch of the other branch for the other branch in the same manner as the Key's. Diagrams 1, 2, 3, 4. The arrangement of C and D are primarily the same, their local wire is made by the connection transfer into two wires each of which is a perfect for registering purposes as the single wire in every respect. It is obvious that the primary circuit may be made to close & open a local circuit in which any number of local vibrations might be included, for instance between New York and Washington where one Company has 115 wires

one of them could be so trapped
 to work in the primary, need another
 by the point a & b signalling
 could go on just the same as if
 the other two were not worked upon
 but, at the same time
 the remaining 14 wires were
~~connected~~ could each be provided
 with a local vibrator ~~unit~~
 and then all placed in one
 local circuit which was
 opened and closed by the rest of
 primary vibrator, and these
 local vibrators would split in
 2 parts by transfer each of
 the 14 wires into two wires each
 making 29 complete wires out
 of 43. If it was desired to
 work Philadelphia & Baltimore
 then primary vibrator could
 be connected up in the centrally
 wire at these places and
 these made to activate the 14
 local vibrators and the
 wires transferred simultaneously
 at all points from one set
 of wires to the other, ~~as shown~~
 as shown in figure 10.

I have shown two main Gallies
MB³, MB⁴ at ~~series~~ X.

but ~~the~~ in practice the
~~one~~ line A², 2, could be allocated
to the Gallies MB³ & MB⁴

Impressed with It is obvious
that the bracket or transition
between 1, 2, 3, 4 of A, Y & B

as well as change of C & D
could be worked by increased
currents or displaced action
by the use of electrical balance
or differential relays;

It is at such points as to
employ a separate branch vibrator

for each line and one way
or another, or in the
might be used and all the

Control points allocated to
it by being properly insulated
The four vibrators A B C & D
may be replaced with the

vibrator shown in Figure 14 which
the wire is split by having four
4 Circuits instead of two;

X is the local vibrating coil its magnet
is being included in a local circuit
opened and closed by the

points of the primary vibrator, 13 is the vibrating rod, 1 and 2 are springs with platinum tips in contact with the platinum points of the springs 5 and 8. The springs 1 & 2 are insulated from the rod 13 while 5 & 8 are in metallic contact with it. 6 and 7 are to limiting pins, 4 and 3 are live contact points to which are connected the branches 15 & 17 containing the polarized relays & keys 21 & 24 20 & 25, — when the reed is in a state of rest the springs 1 & 5 & 2 & 8 are in contact with each other & the current on 1 & 2 being slightly greater than on 2 & 5, operates the primary function of pin 6 & 7. The points 4 & 3 do not touch, but when the reed is set in vibration the spring 2 comes in contact with 3. This causes the current to the branch 17 until the spring 8 touches the limiting pin of silver connection in broken, just as the latter place the selenium 9 comes in contact with the spring 12 throwing the line upon the branch 18, on its return contact is made again between 3 & 2, when the reed goes to the left and that side being provided with exactly the same arrangement the main current is thrown alternately onto 15 & 16 but at no time is the

main circuit, with two branches
 at the same time, of course the
 polarized relays in the branches
 receive enough current to make a current
 but as the relay make about 300
 ohms resistance in each branch there
 is abundant current ~~off~~ to
 give good signal. MB¹ & MB²
 are two better one with the carbon
 relay connected the line with the
 other two the signal point is
 the line, 23, 24, 25 & 26 are
 the double point main signal
 relay. The line up each branch
 in the section with the branch
 to the front of the front
 point. The signal point of the
 MB¹ & MB² make the track
 point. Connected to the main
 signal. The signal MB¹ & MB² the
 main signal of the line by the
 signal line in parallel with
 in parallel circuit into the circuit.
 It is not necessary that polarized
 relays should be used in
 ordinary relays. I shall get
 current. Could be used in
 each branch. It can be explored
 but I prefer to use the polar

[illegible]

Infrequently is shown a modification
 of fig 13, whereby the ventral
 points are dispensed with and
 an ivory surface is laid with contact
 with a magnet. It is also different
 in respect to the number of ^{and} elements,
 to be easily obtained by the use
 of the device. At and to use
 the primary vibration, the
 up and down motion of the
 local current containing the
 local and C, X, K, R and K'
 are the used basis, upon the extreme
 end are two springs, slipped with
 a plate a roller running on a
 flat of surface F, Y, E, which
 with a gear faces each to each
 of the two devices, and are to
 be used in the same way as with
 the use of the same. MB, Y, A, and
 the main contact, which will
 be used, it is desired, to
 when the rods C, X, K, and
 vibration, the rollers of X, K
 pass back & forward over the
 both simultaneously at both
 ends, thus connecting the line
 alternately in several instruments
 at the same time & serves a change.

lines in each second the
 number of circuits ^{obtained} being not
 limited to the inductance of
 the circuit which is a very suitable
 means of the results and the
 delicacy of the measuring instrument.
 In this circuit, I have shown
 a relay relay. The relay
 circuit for the sake of simplicity
 is explained in the operation in
 an operation I prefer to use very
 high resolution & time time delayed
 relay. The relay relay, however,
 Figure 17, is a circuit modification of
 16 whereby the relay is in the form
 of a relay which is related with
 a relay relay by an electric circuit
 to the relay relay by a relay relay
 The relay which is regulated by
 the relay X. E is a block
 to which is secured a relay
 Cyclic wheels & springs in line
 with the relay relay. The
 of the break wheel B, each of
 which is connected to a relay
 key & down line. The main line
 being connected to the break
 wheel; at each vibration of

the need. The line is actually
 11 ohms through the relay 1 2 3
 4 & 5. In practice I prefer to
 use a break control system ~~provided~~
 with a break control system. I have
 upon each of them. There are several
 little ones above the other one.
 It is not the most common one.
 The producing of the machine of
 the solution of the problem is to make
 it. This wheel would also be
 provided with a break control system.
 The break control system is a
 mechanical wheel. The break
 wheel is a mechanical wheel
 controlled by friction, etc.
 Confess myself to the use of an
 electric machine as a means of
 regulating the source of power
 may be used in a clockwork,

~~transferred, the producing a~~
~~great multiplicity of contacts~~
~~I will find it safe. It is arranged~~
~~as follows in relation to the~~
~~transmission of the~~

The primary vibration. In Fig 18
 is shown a small spring having a horizontal axis.
 The orientation for mechanical

action is only shown.

A is the primary vibration
 which consists of a living
 part B. The live part of which
 runs through the hole. A & B
 are joined. C, D, E and F are all
 connected together in a branch
 and make the whole. B & C
 the end of the branch is
 with the spring and obtains
 contact with the line by the
 contact of the spring with the
 with 2. The spring is connected
 to the line. In this manner the
 instrument at both ends are
 powerfully & continuously
 vibrating. The spring 2 also
 is open & closed. It is
 closed by contact with the
 points in the local circuit.

included a second turning fork
provided with 2 magnets
1 pair of poles the same as A.
which are ~~by~~ by the
front battery, L.B. This local
set X vibrating in the same rate
as A. at the ~~point~~^{moment} when the
spring of B comes. The spring of 2
the point of B? comes in contact
with the spring of 5 thereby obtaining
or transferring the same current
from E. C. D. 5 to the relay X Key
K to the battery M.D. the connection
being similar to the one already
described.

X is the local vibrator which
is also similarly the same as A;
with the exception that the contact
points are on the side of it.
Second shown in fig 14. are
placed on the left hand side of
each spring of the front & 1 2 3
4. are the Branch circuits
containing relay 4 key;
I will now describe a method
in which all the connections
for the creation of signal
circuit by rapid transfer are

independently obtained circuit
 the same circuit each one of the
 circuits obtained are again
 independent and transferred thus
 producing a great multiplicity of
 circuits. These are represented
 schematically in figure 19.

Relay circuits in this case so
 as to make the design less more
 easily but in principle is possible
 even having a single circuit to
 be shown in figure 18.

A is the primary vibrator
 connected in the usual manner
 and provided with a local
 circuit which is not connected
 to the main circuit containing
 the relay circuit. B is a
 relay. B, C, D, E, F, G, H, I
 The circuits 1, 2, 3, 4 obtained
 by transfer of the main circuit
 by the vibration of the reed of
 B do not in this case run to
 the relay & back to ground as have
 been previously described but
 are connected each to the
 reed of the local vibrator,
 whose place is between two

41 Contact points on either side of
 the back of each is
 connected to a relay & key &
 means change of relay. Thus
 by the vibration of B we
 obtain 4 branches or signalling
 currents and these by the
 vibration of C, D, E & F are again
 subdivided into two each &
 they passing through the signalling
 instruments allow of eight
 different operations to transmit a
 binary digit. The number of
 bits done so without interference
 with each other. The subdivided
 might be carried still further by
 the use of more than 5 branches
 but I do not think this would
 be practical. except with
 very powerful batteries & delicate
 signalling instruments.
 In the above by Rosenberg an
 electrical whereby 16 momentary
 contacts are obtained with out
 any two coming at the same
 moment of time. This is
 the one figure 20 in A * is

42

The vibrating reed, provided with
contact points & springs in. Zutter
side of which operates in a similar
manner to those specimens frequently
~~When the reed~~ 7-8 & 15 as well as
11-12, & 13 are the same in principle
as 12, 13, 4, 5 & 6.

When the reed is in a slot after
contact the lead to the reed is in contact
with the ground. A closer contact touch
Zutter 5, 6, 7, 15, 13, 12, or 11,
but when the reed moves to the
right the spring 1 comes in
contact with 5 and continues to
make contact until the spring 11
comes in contact with the limiting
pin. When contact is broken at
3 is contacted & in spring 11
just at the point where the contact
is broken the spring 10 comes in
contact with the spring 12
and continues to connect until
the spring 11 is stopped by the
limiting pin when contact is
broken and 12 is brought in
contact with 11. Thus, the main
lead circuit is alternately
(thru) on through ^{the} C, D, & E

and at the same time
 in the late 18th century
 the English people had the
 first the same extent to the point
 with the same extent to the point
 of the same extent to the point

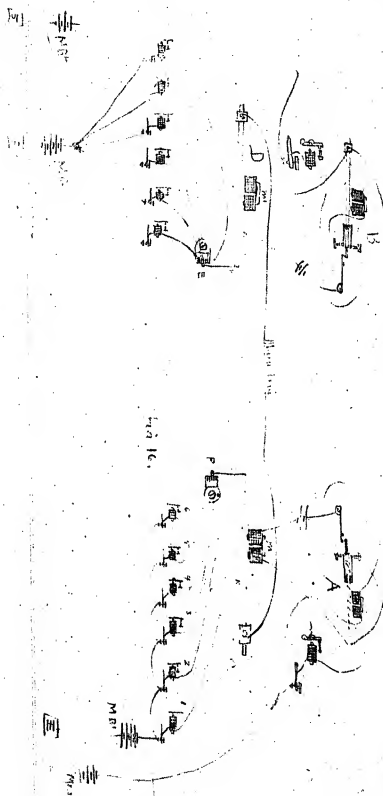
and at the same time

The same extent to the point
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The same extent to the point



Dear Mr. Editor

Ergebnisse der
Manager

This is a specimen of the
standard duplicating ink
with the addition of chemicals
to make it a dense black.
Please give me your opinion
of it

Yours

Wm. A. Edison

Wm. A. Edison

Yours

This is a specimen of the
standard duplicating ink
with the addition of chemicals
to make it a dense black.
Please give me your opinion
of it

Manager

Ergebnisse der

Now is the winter of our
discontent made glorious
summer by this son of yore
and all the clouds that
lowered upon our house
are in the deep bottom of-

Port Huron, Feb 21st 1874

L. J. Ross

Dear Sir

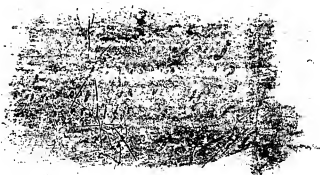
Will you please send me 2 Bost.
of the same kind as you have
you had before and I will
return cost by mail

Yours Resp.

E. P. Edwards

Thos. A. Edison

Dear Sir this is a Specimen
of the work done with the
Arsenic Acid & Chloride of
Calcium Adams.



1000 Broadway Co
The American Novel
New York

Memorandum
November 23
1976

Dear Sir,
I understand that your decision of
proceeding with the article from which
can take several points from
a single writing. I believe you will
find the article to be the
article you require.

Yours
D. A. Edson

Caveats, Unbound Notebook, Cat. 30,104

This set of fifty-six unbound and numbered pages contains two caveats copied from Edison's original manuscript by Charles Batchelor. The first, dated January 26, 1874, is for the duplex telegraph. The second, dated February 1, 1874, is for the Roman letter chemical telegraph. On page 53 is a description in Batchelor's hand of an experiment with an automatic repeater. The entry on page 55 is in Edison's hand and contains a description of a chemical experiment.

Blank pages not filmed: 39, and all even-numbered pages.

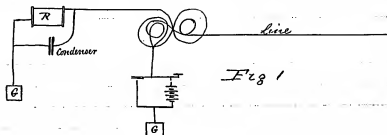
Missing pages: 1-6.

Duplex Apparatus. (Pawcat)

This invention consists of various devices to improve the working of Duplex apparatus, & various modifications to that end.

When the present Duplex is operated upon a short circuit such as 200 or 300 miles in length, & upon which there is but little static induction, the present arrangement of the Condenser, or compensating device of the Artificial line is sufficient to balance the charge of the line, but when the line is 400 or 500 miles or more in length, the static charge is greatly increased, & the present method of connecting a single condenser at the extreme ends of the artificial line is insufficient.

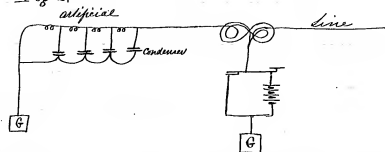
Fig. 1 shows the present method.



In this case the discharge from the line when long would be recorded, thus - - thus from the artificial line due to the condenser thus - Hence after the discharge of the artificial line, the discharge from the line continues & allows the adjustment of the receiving magnet. To operate this I increase the length of the discharge from the artificial line to equal that from the main line by dividing up the condenser in

in several parts & placing it along the resistance coil as in Fig 2. 9

Fig 2.



In this case the discharge from one condenser must pass through the other Condenser & a multiplication of the discharge takes place. & the condenser may be so subdivided up on the total resistance as to find a discharge as long as that from the line. This is particularly valuable on submarine cables where the charge & discharge is very long.

When employed on cables I prefer to use the bridge system shown in fig 3:-

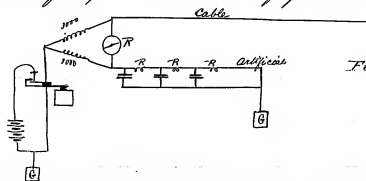


Fig 3

When the resistance of the artificial cable is equal to the resistance of the line or cable & the bridge is equal, & the condenser & resistance of the artificial cable have been so subdivided as to generate a charge & discharge equal to the cable an effect is produced on the receiving instrument R (which may be of any character)

by the outgoing current providing there is no self-induction in coil \mathcal{C} & some in \mathcal{C}' or vice-versa.

When a condenser is used to break the earth current in very long cables the arrangement may be modified as in fig 4:-

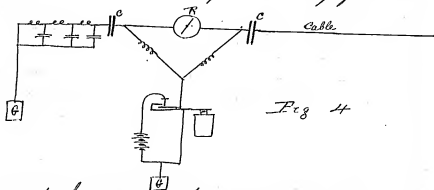
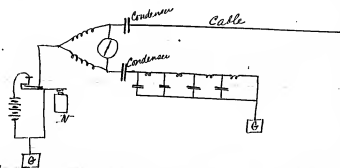


Fig 4

or perhaps it is shown more plainly in Fig 5



In this case the cable is worked entirely by induction the same as the present French cable. Double current may be used by substituting a reversing apparatus of any kind for the single band \mathcal{N} . Fig 5.

Fig 6 shows the reverse I prefer to use.

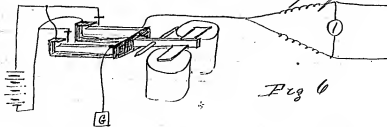
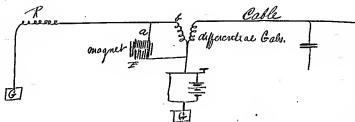


Fig 6

On closing the circuit the two contact springs a & c come in contact with contact points x & c of the battery sending a current in one direction. On opening they come in contact with the point x & pulling the battery on in opposite direction.

The condenser may be dispensed with & a much more effective & economical compensation used instead & viz. - an electromagnet the inductive charge & discharge of which may be made equal to the longest cable.

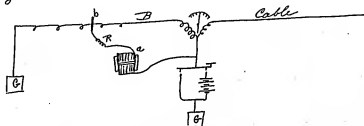
Fig 7 shows the device.



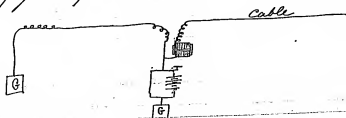
The electromagnet has its armature permanently attached to the core so as to generate as great a discharge as possible. On closing the key the battery passes through both coils of differential Galvanometer, the coils being wound in opposite directions so the current passed through in opposite in opposite directions. If the resistance of cable be equal to artificial line & no static induction were on cable & the magnet F was disconnected, no effect would be seen on needle; but if magnet E be connected the current from battery passing through it would generate an induction charge which would circulate within the closed circuit formed by a & b & instantly deflect the needle for an instant in one direction, if now the cable has an inductive capacity & the magnet was disconnected & battery put on, the static charge would throw the needle instantly in

the opposite direction, but if the magnet be connected both charges neutralize each other effect on the needle & it remains unaffected. The length & resistance of magnet can be so proportioned as to generate a charge equal in strength & length to the static charge on the longest cable. The strength of the discharge from the magnet may be regulated by placing it at any point on the resistance scale of the artificial line as in Fig 8.

Fig 8.

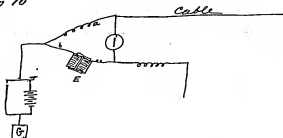


The slide B may be placed at any point on the resistance box, thus increasing the resistance of the discharging circuit B to D . The charge & discharge may be also regulated by the adjustable resistance R in the wire containing the electromagnet, it may also be regulated by making the armature of electromagnet adjustable & receding from the core to decrease the strength of the induction current, & approaching to strengthen it. By using the electromagnet a much less resistance is necessary in the artificial line. The electromagnet may be placed in cable & almost the same effect produced thus in figure 9.



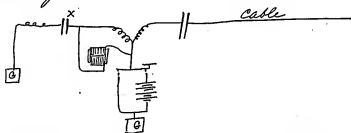
In this case the induction charge & discharge of the magnet compensates or neutralizes the effect of the static charge directly in the cable itself. When the magnet is to be arranged in a bridge it should be arranged as shown in Fig 10

Fig 10



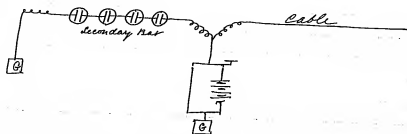
The charge & discharge of electromagnet E circulating in wire a.t. balance the effect of static charge in cable

When the cable is to be worked by induction (e.g.) with a condenser as is at present used on the French Atlantic cable the magnet may be arranged thus - Fig 11



The momentary charge due to the condenser x on the artificial line allows the magnet to send a charge & discharge which acting on the differential Galvanometer neutralizes the effects of the extra charge & discharge on the cable:-

Both the magnet & the condenser may be replaced by a secondary battery as in fig 12

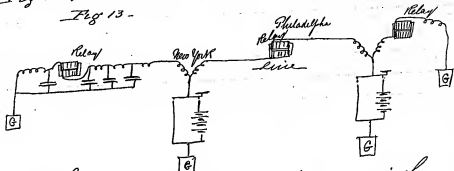


On closing the circuit (G) putting on the battery the current on the artificial line is strongest at the first instant of closing, which is due to the fact that the secondary battery formed of plates of metal of the same kind immersed in water or chemical solution, sets up no opposing electromotive force at first, but very quickly sets up an opposing electromotive force to the battery current. When the battery is on permanently the resistance coils of the artificial line should be adjusted so that with the electromotive force the current should be equal to that in the cable. Now on disconnecting battery the secondary battery send a charge in the same direction as the static discharge on the cable & both acting in the double coils which are wound in the opposite direction neutralize each other effect, & the needle remains unaffected by the outgoing current.

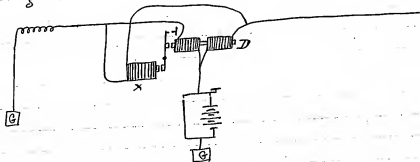
On land wire considerable trouble is found from the discharge of relay magnet induced by mistake in the wire working duplex. The discharge from these relays destroy the balance at both ends of the wire. Speedily this inserting at each end a relay or electromagnet nearly of the same

character as the relay which is supposed to be in the line & in that portion of the artificial resistance as will allow of its charge & discharge to balance that inserted in the line
Fig 13 shows this

Fig 13 -



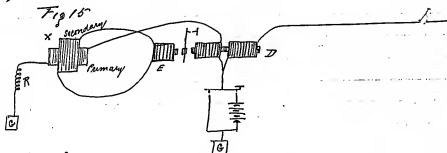
In the instrument at present used in this country, but half of the wire upon the magnet is available to give effect to the current from the distant station, the other half being used for the secondary or artificial line & of course as far as the distant current is concerned is of no use. I obviate this to a great extent by combining the double coil or differential principle with the bridge principle as in Fig 14.



D is a double wound portion of the receiving relay, the wire being wound side by side or on two separate bobbins both of the same resistance. If the magnet X is disconnected the outgoing current may be balanced in the differential coils D. If now the magnet X is added

It forms a bridge wire between the two circuits & no current passes through but the current from the distant station passes through one coil of D & through the magnet X thus giving double effect & that current without any disadvantage whatever. It also tends to neutralize the self induction of one of the spools of D on the other when the distant current is received.

On circuits of ordinary length where the static induction is very light the Magnet condenser & secondary battery may be dispensed with, & an induction extra magnet need as in Fig 15.

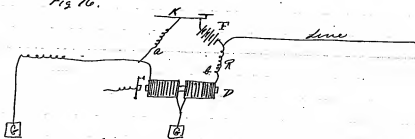


In the equalizing circuit is an induction coil X whose primary is in the circuit & whose secondary is connected to an extra, attractive magnet E of the duplex relay D . At the moment of putting on the battery the static charge will charge D , but the induction discharge from the induction coil X acting on the magnet E sets up a retractile power equal to the power due to the static charge in D & the effect is balanced.

Considerable trouble is also found with the present contact devices owing to the spark eroding the points & also of the springs getting out of adjustment & multistating the signals. Fig 16 shows a

method in which no contact springs are used a common sounder point or Morse key may be used.

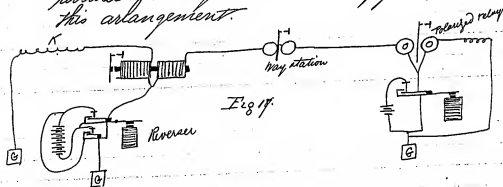
Fig. 16.



K is the sounding key. If the main battery by the resistance of the two branches containing the spools of D which in this particular instance are wound in the same direction so that the current passes through them in the opposite direction are equal no effect is produced on the instrument by closing the key K. Putting in battery, the current from the battery circulates in 3 closed circuits, first being in circuit a, b, second the artificial line & third, on regular line. The battery to be used being a quantity one is capable of supplying several circuits.

The resistance of a, b, is about ($\frac{1}{2}$) one fifth the resistance of the line & may be even less. To prevent the effect of the static charge a magnet, condenser or secondary battery may be inserted as shown in former figures. It is sometimes required that a way station on a duplex wire shall receive the signals from one of the ends. To attain this object by inserting a short relay at some intermediate station & double the battery, at the station from which he is to receive & make the strength of the battery twice that of the other end, hence by adjusting for the heavy battery, he will

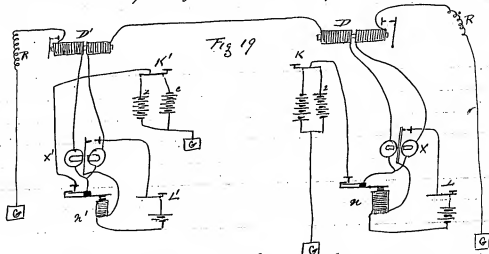
receive the signals due to it but not of the weaker battery. It may be also done by using a differential polarized relay at the way station & at one of the end stations & using an ordinary relay at the other station. In this case reversed currents are sent from one station with a battery, twice the strength of the other battery which sends currents on the line always in the same direction. The heavy battery will actuate all the polarized relays at the way stations & at one of the end stations, while it will not interfere with the reception of a signal on the ordinary relay at the other station. Probably some difficulty will be experienced at the end station having the polarized relay in the reversal of the equator current figure 17 shows this arrangement.



A very important adjunct to Duplex is arranging it at terminal stations with several branch offices so that they can all use the circuit. Fig 18 shows a method of obtaining this result without excessive complication.

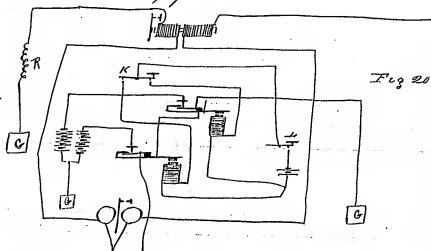
The instruments in the main office are arranged in the usual manner. It is the signalling sounder which is placed on a city circuit running to the branch office. At each branch office there is a solenoid & key for breaking circuit. These keys.

other operators the place where he desires a repetition. This of course stops for an instant all four men which would not be the case were two separate wires used for them when a repetition was required but two operators would be stopped, sometimes when equating is difficult or defective the delay from this cause is considerable. Fig 19 shows a plan by which one operator may interrupt this path without stopping the other 2 operators. —



The connection in this method are precisely similar to those ordinarily used with the exception of inserting double coil differential polarized X, X' at each end of the circuit both of main & equating, & an extra reverse battery which may be brought into action by depressing the key K, K' . We will now suppose that D' is receiving from m , operated by key L & wishes to interrupt he depresses the key K' & holds it down; this changes the signalling battery from zinc to copper & the arm of polarized relay X flies over to the other side & opens the circuit in which n is placed. This opening notifies the man at n that he must go back one or two words.

This reversal of battery does not affect D which receives its signal from M.L. as the relay D works as well on a positive battery as a negative. The connections being both alike at each station. Of course D can stop M.L. by depressing the key K. & D can stop M.L. by depressing the key K'. No signalling can take place between K' & M as a series of change of currents would interrupt D, but one single change will not give a perceptible interruption as there is a slight break in the continuity of the circuit in the key. K. K'. For signalling sounders might be used as in figure 21.



By closing the key K I would operate either one or the other of the 2 signalling sounders thus reversing the signalling without interrupting the distant sender.

My claims will probably be
 1st subdividing the condensers & resistance coils composing the artificial equating circuit for the purpose set forth.
 2nd The arrangement of a subdivided artificial line with a cable or land line

worked by induction from condensers
- as set forth

3^d The manner of sending reversal
in a Duplex apparatus page. 11. Fig 6

4th The combination of an induction
electromagnet with a Duplex as in Fig 7 & 8

5 The combination of an electromagnet with
a Duplex apparatus as in Fig 9

6 The magnet H in the bridge of the
Duplex for purpose set forth. fig 10

7 The secondary battery arranged as
shown in fig 12 for the purposes set forth.

8 Compensating for relay placed in the
Duplex circuit at way stations, by the
insertion of a similar relay in the
adjacent circuit. Fig 13

9 The extra magnet X arranged with the
Duplex relay to for the purpose set forth
for 14.

10 Compensating for the static charge as
shown in fig 15

11 The arrangement for connecting & dis-
- connecting etc shown in fig 16.

12 The manner of signalling way stations
by an increase of one of the signalling
batteries over the other fig 17.

13. Signalling way stations from by reversals & receiving from the distant station by a single current.
14. The method shown in fig 18 for working duplex a number of branch offices
15. The manner of "breaking" or connecting wires shown in fig 19.

Newark, N. J. } Copied from Edison's original
 Jan. 26, 1874. } Manuscript by Chas. T. Fletcher

Roman letter Chemical Telegraph. (Caveat.)

The object of this invention is to transmit & receive & record Roman letters, the first of which is done by Roman letters perforated in strips of paper of which a patent has already been applied, & the letters, according to chemically prepared paper by electric decomposition the letter is perforated. Several methods have been already described in a previous caveat whereby this may be accomplished on two or more wires.

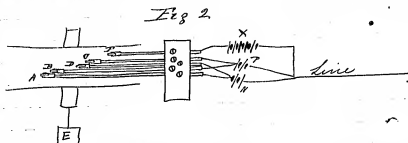
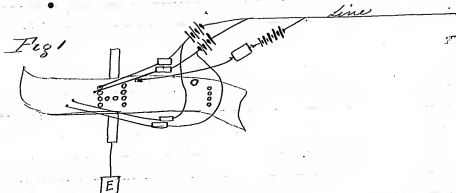
The present invention consists of mechanical devices as well as electrical for operating upon one wire. The main feature of which is to send half of the Roman letter over the wire from the perforated paper with positive & negative currents. One pen both of the transmitter & receiver being at one line of perforations (forming a letter) ahead of the wire, & by a director, commutator, or circuit breaker, connected with the receiving instrument throw the line over, on another set of receiving pens & record the balance of the letter. The circuit change is controlled by a sensitive electromagnet provided with a lever which holds & releases an escape pulley wheel at the beginning of every letter.

Each letter of the perforated paper is formed of small holes, at the commencement of each letter & right below it is a large perforation which has a separate contact with by itself & when no other roller is through a small hole passes through this large hole & put a strong current of three times the duration of the current transmitted from the perforation.

forming the letter. This wave actuates the magnet at the distant station for an instant when its lever is drawn away from the escape wheel allowing the circuit changes to resolve itself. This circuit changes in revolving one tooth first connects the line & earth wire, just to two recording pens (the last ones) when this has formed half of the letter the circuit changes which is still revolving, disconnects the line & earth from back pen & throw it on the first 2 pens until the other half of the letter is formed; at this moment the circuit change is directed by the lever of the electro-magnet coming in contact with one of the teeth of the escape wheel. I now lay still till another large hole before a letter passes under the extra roller pen at the transmitting station when another wave is sent & another letter is printed. Thus by sending an extra wave before each to regulate the recording mechanism & change from one letter to another perfect synchronism is unnecessary & the whole use of the wire is utilized to make the letter or in other words: - Positive followed immediately by a negative forms half of the letter & immediately the wire is thrown over on a new set of receiving pen where the same action takes place, thus keeping the wire constantly at work.

The peculiar manner in which the letter must be formed gives its own spacing without ceasing sending currents but the wire to give a space as is usual.

I'g shows the arrangement of the contact rollers at the sending station: -



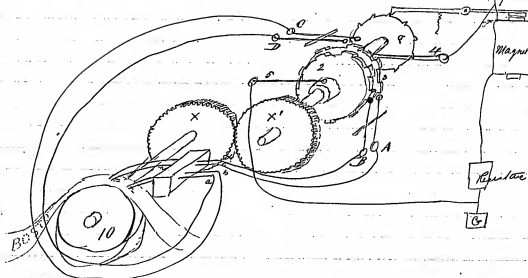
In forming a letter first F comes in contact with the drum through the large hole putting large battery X & coil & earth & sending a strong current over the wire which actuating the electromagnet sets the circuit changer in motion (when the circuit changer is actuated the line is not in connection with either set of pens) As the letter passes along the top passes under C sending a positive to line, then D, sending a negative to line & so until the whole of the letter has passed under CD, the lower portion of the letter now comes in contact with A.B. which act. precisely as C.D. After the letter has passed under both the circuit changer at the distant end is actuated & another large hole passes under F setting the changer at the distant end going & another letter is recorded.

The perforated letters are separated from each other the distance of the space taken up by the largest letter of the alphabet & a little

more the extra space being used for the large hole. I do not want to confine myself to regulating the distant circuit changes at every letter as the large hole may be used only between words providing the transmitting & receiving nearly synchronously.

Neither do I wish to confine myself to changing the line wire from one set of pens to the other sep electrically as the pens instead of having the line dis-connected from them may be lifted off the paper (ie) when one set is doing work the other set is lifted off the paper & vice-versa. The lifting may be controlled by a magnet actuated by waves sent from the distant or transmission station, neither do I want to confine myself to using 2 sets of pens as one pen may be used which may be shifted sideways four or more times. The top part of any letter being transmitted first then the pen shifted by the mechanism of the receiving machine & the next portion of the letter sent & recorded then the third & last the fourth when the receiving pen is replaced by the mechanism in its original position ready to make the next letter the time of starting to start being controlled by the magnet Fig 3 shows the recording instrument.

10 is the drum by which the chemically prepared paper is drawn forward, a, b, c, d, are the four recording pens; e, d, are set the length of one letter ahead of a, b. Wire lead from a, b to the circuit changing contact roller D.C. Wire also lead from c, d to the contact roller arms A.B. These contact rollers are so positioned regarding the two toothed wheels 2, 3, which are insulated from each other



that while at rest neither set of rollers have contact with the teeth of either wheel, but while in motion *CD* first comes in motion contact with the two teeth of wheels 2, 3. (These wheels are connected one with the line the other with the earth through the points 4 & 5) after they leave the teeth *B, A*, pass on a tooth; at no time is *CD* & *AB* on a tooth at the same time. It will be noticed that the recording pens *a, b* are first connected with the line & ground by *DC* & record half of the letter, then the pens *c, d* are connected to the line & earth by points *AB* recording the other half, when this is done a new tooth on the escape wheel 8 will come in contact with the lever of the magnet & the wheels 2, 3, which are carried around by friction only will be arrested while the wheel 10 will keep on. At the moment they circuit changing wheels are stopped the magnet receives a new impulse from the large hole in the perforated paper & releases

The wheels 2 & 3 & another letter is printed.

I shall probably claim the arrangement
of the transmitting pens as set forth &
for purpose specified.

2nd The use of an extra perforation
in Roman letter perforated strips for reg-
ulating the distant recording machinery
within each letter word or number of
words.

3rd The exact change or its equivalent
for the purpose set forth.

Signed
Feb 1st 1844. Copied from Edison's original
manuscript by Chas. Batchelor

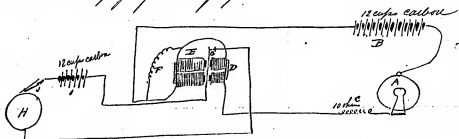
Automatic Repeating

Feb 9, 1874. Experiment tried this night. Making it repeat automatically at high rates of speed & not being able to attain more than sixty (60) words per minute with an ordinary relay we constructed one as in fig 1:-



- A is a (22) twelve shun magnet
- B is a (200) two hundred shun magnet
- C is a shunt with resistance
- D is armature lever & repeat points-

By this relay we were enabled to get (237) two hundred & fifty words per minute repeated & recorded perfectly on chemically prepared paper



In this relay there is no adjusting spring required. When you close at A the magnet B does not charge right away owing to a counter current in B but the short magnet D charges instantaneously closing repeating points at C.

Is sesquioxide of iron soluble in nitric acid,

55

Solution.

Sulphocyanide of potassium is a very sensitive test for the sesquioxide of iron - more delicate than either the ferricyanide of pot for the protoxide or the ferrocyanide of pot for sesquioxide or per oxide, therefore if I can convert the proto formed by electrical decomposition into sesquioxide the presence of the sulphocyanide immediately produces an intensely blood red reaction. Now nitric acid will convert the proto to a sesqui for I believe it will dissolve the oxide after it changes it and it may produce some bad effect on the sulphocyanide. In Ferrius page 42 I find that Chlorine water (i.e. chl.) changes the proto to sesqui - now it is probable that if I make a sol of sulpho & oxymuriatic acid that the free chl or the oxymuriatic will change the proto & without effecting the sulphocyanide, if not by chl water or hydrochl acid to which is added slight amount chlorate pot - Iron pen

Caveat Drawings

This set of drawings covers the years 1876-1878 and is organized according to caveat number. The drawings relate to the telegraph (caveats 74 and 75) and the phonograph (caveats 77 and 80). The numbers 77 and 80 were later assigned to other caveats which are known to have been filed at the U.S. Patent Office. The later version of Caveat 80 can be found in D-78-028 (Patents) in the Document File.

T. Edison,

25 Sheet 5 Sheet 1.

Caseat 74.

Filed Jan. 14, 1876.

Fig: 1.

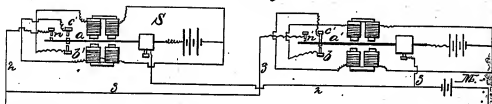


Fig: 2.

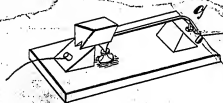
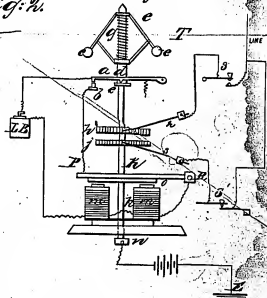


Fig: 6.

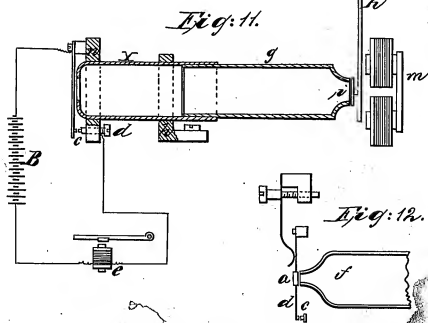
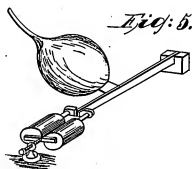


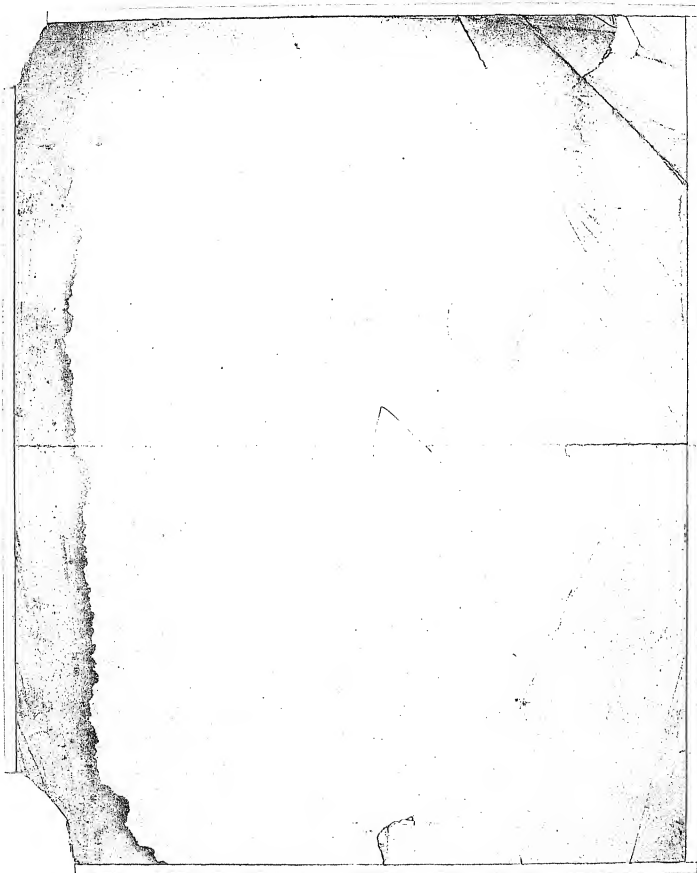
T. Edison,

237 West 5th Street 2.

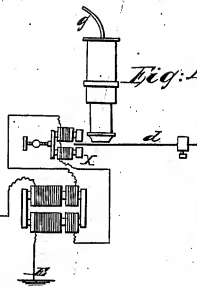
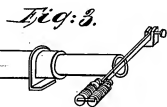
Carbide 741 ✓

Filed Jan. 14, 1876.





Leaves 74



LINE

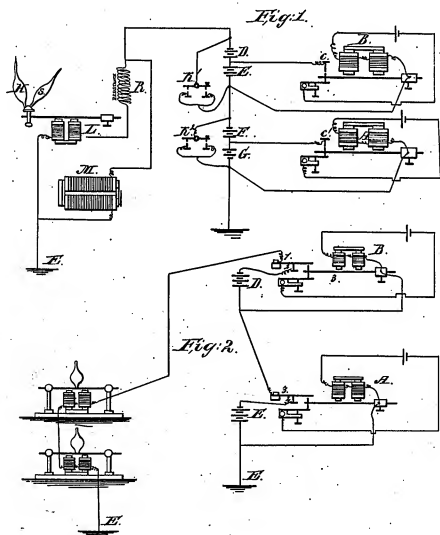
4 Sheets, Sheet 1

T. A. Edison,

Acoustic Telegraph.

Patent 75,

Filed Jan. 14, 1876.



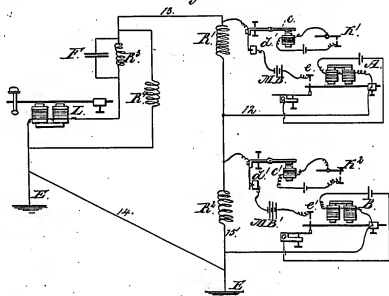
2 Sheets Sheet 2.

T. A. Edison,

Acoustic Telegraph.

Caveat. 75

Fig. 3. Filed Jan. 14, 1876.



75

Fig. 4.

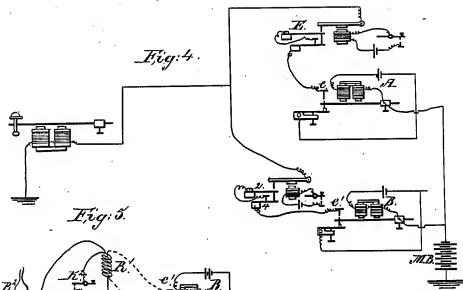
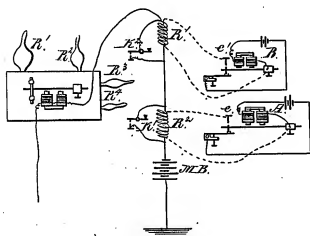


Fig. 5.



T. A. Edison,

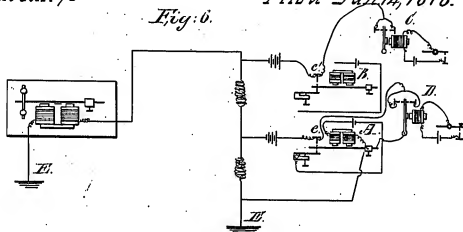
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Acoustic Telegraph.

Caveat. 75

Filed Jan 14, 1876.

Fig. 6.



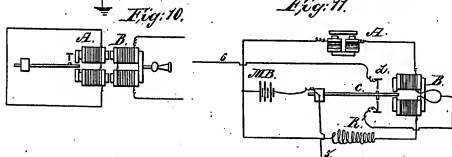
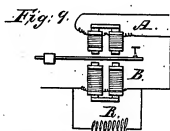
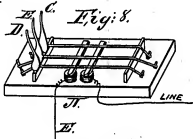
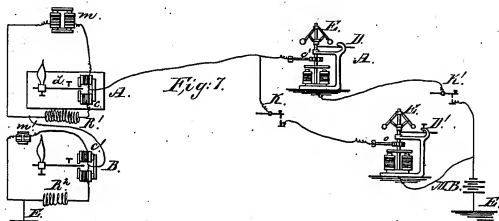
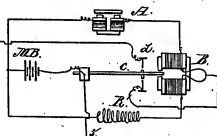


Fig. 11.



*T. A. Edison,
Acoustic Telegraph.*

Caveat. 75

Filed Jan. 14, 1876.

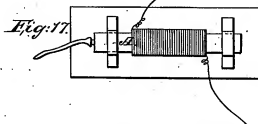
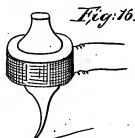
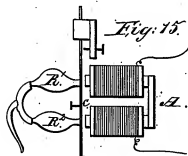
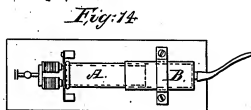
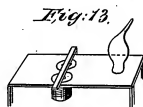
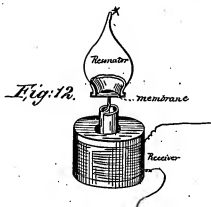


Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 7.

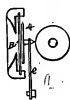


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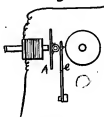


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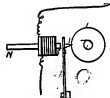


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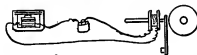


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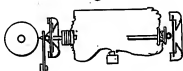


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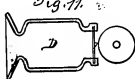


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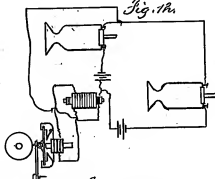


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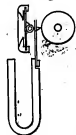


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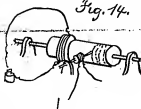


Fig. 15.



Fig. 16

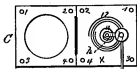


Fig. 17



Fig. 18

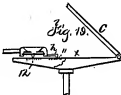
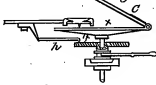


Fig. 20



Fig. 21

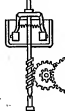


Fig. 22



Fig. 23



Fig. 24



Fig. 25



Fig. 26



Fig. 27

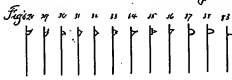
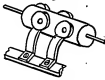


Fig. 29

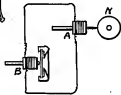


Fig. 30



Fig. 31



Fig. 32



Fig. 33



Fig. 34



Fig. 35



Fig. 36

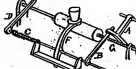


Fig. 37



Fig. 38



Fig. 39



Fig. 40



Fig. 41



Fig. 42



Fig. 43



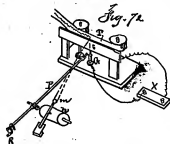
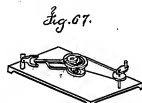
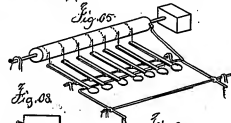
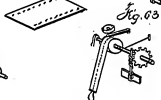
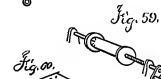
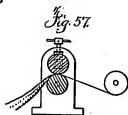
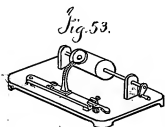


Fig. 74.



Fig. 76.



Fig. 75.



Fig. 77.



Fig. 78.

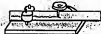


Fig. 79.



Fig. 80.



Fig. 81.



Fig. 83.



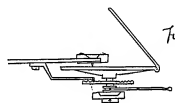


Fig. 19



Fig. 21

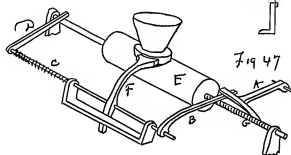


Fig. 47

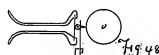


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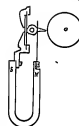


Fig. 14

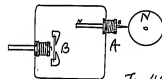


Fig. 40

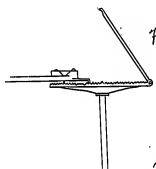


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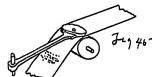


Fig. 44



Fig. 41

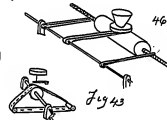


Fig. 43

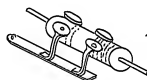


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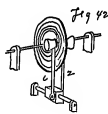


Fig. 42

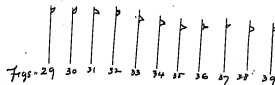


Fig. 29-39

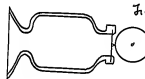


Fig. 12



Fig. 40



Fig. 26



Fig. 28



Fig. 24

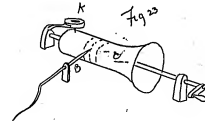


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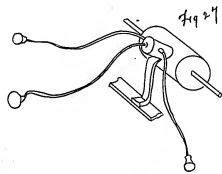


Fig. 27



Fig. 3



Fig. 8

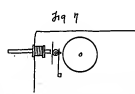


Fig. 7

Carroll 77

Carroll 773



Fig. 3

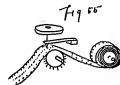


Fig. 55



Fig. 10



Fig. 14



Fig. 15



Fig. 16



Fig. 17



Fig. 18

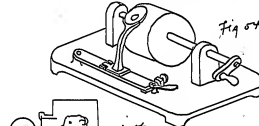


Fig. 56



Fig. 57



Fig. 58



Fig. 59



Fig. 16

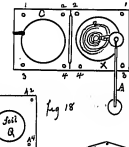


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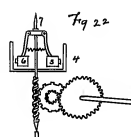


Fig. 22



Fig. 60

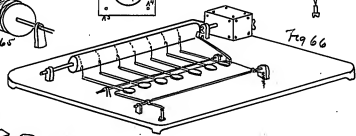


Fig. 66



Fig. 67



Fig. 68



Fig. 63



Fig. 64



Fig. 62



Fig. 60



Fig. 61

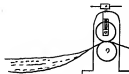


Fig. 69



Fig. 56



Fig. 15



Fig 67



Fig 68



Fig 69

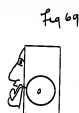


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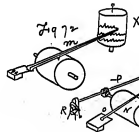


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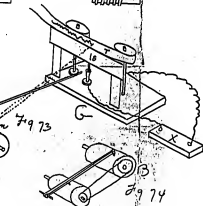


Fig 72

Fig 73

Fig 74

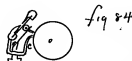


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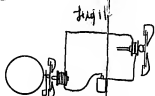


Fig 76



Fig 77

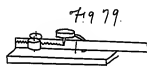


Fig 78



Fig 79



Fig 80



Fig 81



Fig 82

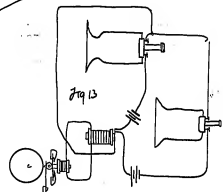


Fig 83

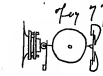


Fig 84



Fig 85

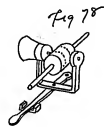


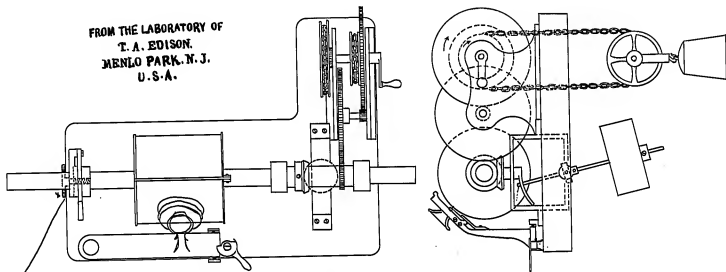
Fig 86

Connect 77 X

Shaded

Cavendish 80 20

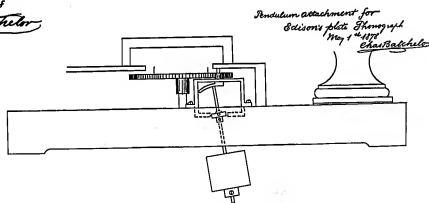
FROM THE LABORATORY OF
T. A. EDISON.
MENLO PARK, N. J.
U. S. A.



Edison's Speaking Photograph
with clock work and pendulum regulator.

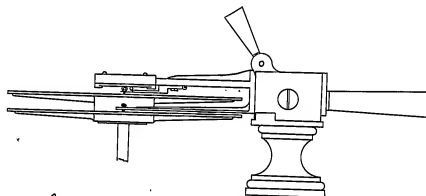
The top of this bearing for shaft is made
adjustable sideways so that if the point
on cylinder is not quite opposite groove
on cylinder by turning thumb nut it
will move the cylinder, shaft on top of bracket
both sideways.

April 30 1878
Chas. Batchelor

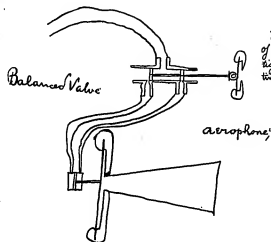
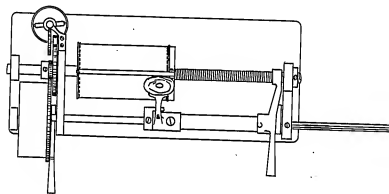


Pendulum attachment for
Edison's plate photograph
May 1 1878
Chas. Batchelor

No 82



No 83



Caveat-88

Mention that the grooved exterior of the phonor may be covered by tightly stretched Gum Rubber and two thin felt laid over this rest—

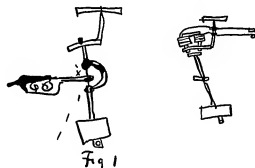


Fig 2

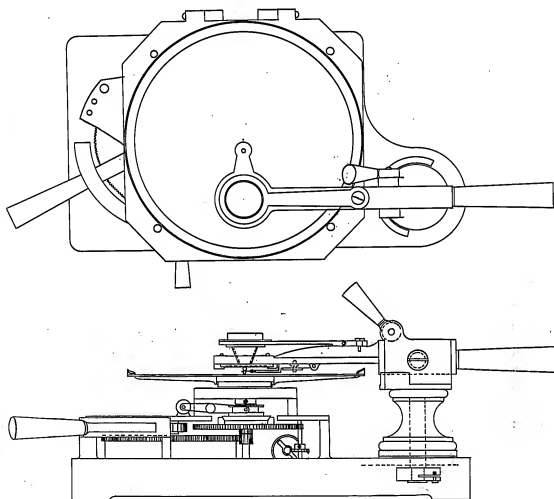
Fig 1 shows a conical pendulum it being suspended at A by a thin wire.
 Fig 2 shows the pendulum carried around by magnetic attraction either an electric magnet and battery or a permanent battery.
 This responds to the slightest change of speed and regulates faster than when the same shaft is carried around by the same the friction being an obstacle to perfect regulation.



Process for making photographic records of machine duplications.
 Process. The first plate introduced is placed in a glassy bath and an electrotype taken therefrom. This is a reversed electrotype is taken. This is fixed up with paper under black and placed under an engraving press. A sheet of gold leaf paper is placed on the electrotype which is covered with gold for engraving reproduction. A set of non-ferrous material somewhat elastic is placed on the electrotype. This is done upon the face, the plate of the same size as the electrotype is placed on the above of the paper. This is done by the same press and a perfect reproduction of the original is had and many hundred more may be obtained by the same process.

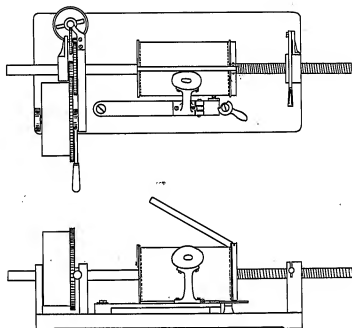
The second process consists in substituting a plate of Paris block for the electrotype, that being hard enough to allow of many impressions being taken.

No 29.

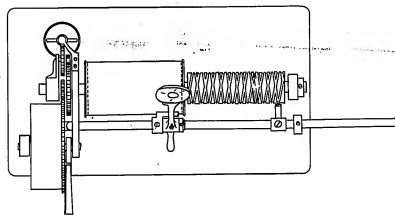


No 30

Canest 80



No 31



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END

8

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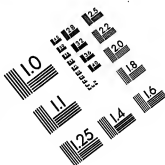
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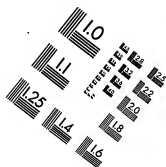
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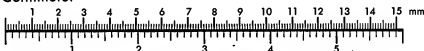


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